2022

Final Examinations

on Algebra and Statistics



Model Examinations of the School Book on Algebra and Statistics

Model 1

Answer the following questions :

1 **Choose the correct answer from those given :**

1 The point (– 3 , 4) lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

2 The positive square root of mean of the squares of deviations of values from its arithmetic mean is called ....

(a) the range. (b) the arithmetic mean.
(c) the standard deviation. (d) the mode.

3 If 3 a = 4 b , then a : b = ...

(a) 3 : 4 (b) 4 : 3 (c) 3 : 7 (d) 4 : 7

4 If n (X) = 2 , n (Y^2) = 9 , then n (X × Y) = ...

(a) 6 (b) 18 (c) 11 (d) 7

5 The range of the set of the values : 7 , 3 , 6 , 9 and 5 is ....

(a) 3 (b) 4 (c) 6 (d) 12

6 If y ∝ X and y = 2 when X = 8 , then y = 3 when X = ...

(a) 16 (b) 12 (c) 24 (d) 6

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2 **[a]** If X × Y = {(2 , 2) , (2 , 5) , (2 , 7)}

, **find :** 1 Y 2 Y × X

[b] If a , b , c and d are proportional , **prove that :** $\frac{a}{b-a} = \frac{c}{d-c}$

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3 **[a]** If X = {2 , 3 , 5} , Y = {4 , 6 , 8 , 10} and R is a relation from X to Y where "a R b" means "2 a = b" for all a ∈ X , b ∈ Y

1 Write R and represent it by an arrow diagram.

2 Show that R is a function.

[b] Find the number that if we add it to each term of the ratio 7 : 11 , it becomes 2 : 3

4 [a] If $X = \{1, 3, 5\}$ and R is a function on X , where $R = \{(a, 3), (b, 1), (1, 5)\}$

, find :

1 The range of the function.

2 The value of a + b

[b] If $y \propto \frac{1}{x}$ and y = 3 when $x = 2$

, find :

1 The relation between x and y

2 The value of y when $x = 1.5$

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5 [a] Represent graphically the function $f : f(x) = (x-3)^2$, $x \in [0, 6]$, from the graph deduce the vertex of the curve , the minimum value of the function and the equation of the axis of symmetry.

[b] **Calculate the arithmetic mean and the standard deviation of the set of values :**

8 , 9 , 7 , 6 and 5

Model 2

Answer the following questions :

1 Choose the correct answer from those given :

1 The point (3 , 4) lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

2 .... is one of the measures of the dispersion.

(a) The median (b) The arithmetic mean

(c) The standard deviation (d) The mode

3 The third proportional of the two numbers 3 and 6 is ....

(a) $\frac{1}{2}$ (b) 9 (c) 2 (d) 12

4 If n (X) = 2 , n (Y × X) = 6 , then $n(Y^2) =$ ....

(a) 4 (b) 9 (c) 16 (d) 12

5 The range of the set of the values : 7 , 3 , 6 , 9 and 5 is ....

(a) 3 (b) 4 (c) 6 (d) 12

6 If $x y = 7$, then $y \propto$ ....

(a) $\frac{1}{x}$ (b) $x - 7$ (c) x (d) $x + 7$

2 [a] If $X = \{2 , 5\}$, $Y = \{1 , 2\}$, $Z = \{3\}$

, **find :** 1 $n (X \times Z)$

2 $(Y \cap X) \times Z$

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a - b}{a - c} = \frac{b}{b + c}$

3 [a] If $X = \{1 , 3 , 4 , 5\}$, $Y = \{1 , 2 , 3 , 4 , 5 , 6\}$ and R is a relation from X to Y where "a R b" means "a + b = 7" for all $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Show that R is a function.

[b] If $5 a = 3 b$, **find the value of :** $\frac{7 a + 9 b}{4 a + 2 b}$

4 [a] If $f (x) = 4 x + b$ and $f (3) = 15$, **find the value of :** b

[b] If $y \propto x$, $y = 6$ when $x = 3$, **find :**

1 The relation between x and y 2 The value of y when $x = 5$

5 [a] Represent graphically the function $f : f (x) = 4 - x^2$, $x \in [-3 , 3]$, from the graph deduce the vertex of the curve , the maximum value of the function and the equation of the axis of symmetry.

[b] **The following frequency distribution shows the number of children of some families in a new city :**

Number of children	0	1	2	3	4	Total
Number of families	6	15	40	25	14	100

Calculate the mean and the standard deviation of the number of children.

Model for the merge students

Answer the following questions :

1 Complete :

1. The point (5 , 3) lies in .... quadrant.
2. n : n ($\mathcal{X}$) = $\mathcal{X}^3 + 8$ is called a polynomial function of .... degree.
3. The range of the set of the values : 4 , 14 , 25 and 34 is ....
4. If y = 2 $\mathcal{X}$, then y $\propto$ ....
5. If X = $\{2 , 4 , 6\}$, then n (X^2) = ...
6. If (a , 3) = (6 , b) , then a + b = ...

---

2 Choose the correct answer from those given :

1. If $\mathcal{X}$ y = 7 , then y $\propto$ ....

   (a) $\frac{1}{\mathcal{X}}$ (b) $\mathcal{X} - 7$ (c) $\mathcal{X}$ (d) $\mathcal{X} + 7$

2. If 2 , 3 , 6 and $\mathcal{X}$ are proportional , then $\mathcal{X}$ = ...

   (a) 9 (b) 18 (c) 12 (d) 3

3. If 2 a = 5 b , then $\frac{a}{b}$ = ...

   (a) $\frac{-5}{2}$ (b) $\frac{-2}{5}$ (c) $\frac{2}{5}$ (d) $\frac{5}{2}$

4. .... is one of the measures of the dispersion.

   (a) The arithmetic mean (b) The range
   (c) The mode (d) The median

5. If n (X) = 5 , n (X × Y) = 10 , then n (Y) = ...

   (a) 4 (b) 3 (c) 2 (d) 1

6. If X = $\{1\}$, then X^2 = ...

   (a) 1 (b) (1 , 1) (c) $\{(1 , 1)\}$ (d) $\{1\}$

3 **Put (✓) or (✗) :**

1 If the function $f = \{(1, 3), (2, 4), (3, 3)\}$

, then the domain of the function is $\{1, 2, 3\}$ ( )

2 If $y \propto x$ and $y = 6$ when $x = 3$, then $y = 2$ when $x = 4$ ( )

3 If $\sum \left(x - \overline{x}\right)^2 = 36$ for a set of values whose number equals 9, then $\sigma = 4$ ( )

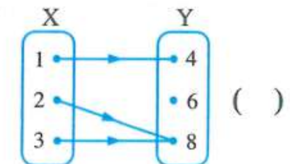
4 The intersection point of the straight line $f(x) = x + 2$

with x-axis is the point $(-2, 0)$ ( )

5 If $f : X \longrightarrow Y$, then X is called the domain of this function. ( )

6 The arrow diagram from X to Y

represents a function. ( )



4 **Join from column (A) to column (B) :**

(A)	(B)
1 If $(1, 4) \in \{2, x\} \times \{1, 4\}$, then $x =$	• 6
2 If the function f where $f(x) = x - 4$ is represented graphically by a straight line passing through the point $(a, 2)$, then $a =$	• 1
3 $\frac{1}{2} = \frac{3}{6} = \frac{4}{8} = \frac{\cdots\cdots}{16}$	• 10
4 If $f(x) = 5$, then $f(5) + f(-5) =$	• ± 6
5 The middle proportional of the two numbers 4 and 9 is	• 2
6 **In the opposite figure :** The equation of the line of symmetry is $x =$	• 8

Governorates' Examinations on Algebra and Statistics



1 Cairo Governorate



Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1. If $(a + 3 , b - 1) = (-2 , 4)$, then $a + b =$ ....
   (a) 0 (b) 2 (c) 5 (d) 10
2. If $x - y = 5$, then $6x - 6y =$ ....
   (a) 30 (b) 11 (c) 1 (d) -1
3. If x , 3 , 4 and 6 are proportional , then $x =$ ....
   (a) 0 (b) 1 (c) 2 (d) 3
4. $\{3\} \cup]3 , 5] =$ ....
   (a) $\varnothing$ (b) $\{3\}$ (c) $]3 , 5]$ (d) $[3 , 5]$
5. The positive square root of mean of the squares of deviations of the values from their arithmetic mean is called ....
   (a) the range. (b) the standard deviation.
   (c) the median. (d) the mean.
6. If $x^2 = 25$, where $x \in \mathbb{Z}$, then $x =$ ....
   (a) 5 (b) -5 (c) ± 5 (d) -25

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2 [a] If $X = \{2\}$, $Y = \{3 , 4 , 5\}$, **find :**

1. $X \times Y$ 2. $n(Y^2)$ 3. X^2

[b] If $\frac{a}{b} = \frac{3}{5}$, **then find the value of :** $\frac{7a + 9b}{4a + 2b}$ in the simplest form.

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3 [a] If $y \propto \frac{1}{x}$ and $y = 3$, when $x = 2$, **find :**

1. The relation between y and x 2. The value of y when $x = 1.5$

[b] If $X = \{1 , 3 , 4 , 5\}$, $Y = \{2 , 3 , 4 , 5 , 6\}$ and R is a relation from X to Y where "a R b" means "$a + b = 7$" for all $a \in X$, $b \in Y$ write R and represent it by an arrow diagram. Is R a function ? Why ?

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4 [a] **The following frequency distribution shows the ages of 10 children :**

Ages in years	5	8	9	10	12	**Total**
Number of children	1	2	3	3	1	**10**

Calculate the standard deviation to ages in years.

[b] Graph the curve of the function $f : f(X) = X^2 + 2X - 4$, where $X \in [-4 , 2]$

From the graph find :

1 The vertex of the curve.

2 The equation of the axis of symmetry.

---

5 **[a]** If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

[b] If $f(X) = X^2 - 2X$, $g(X) = X - 2$

1 **Prove that :** $f(2) = g(2)$

2 If $g(k) = 7$, **find :** the value of k

2 Giza Governorate



Answer the following questions :

1 **Choose the correct answer :**

1 If $X \in \mathbb{R}$ and $1 < X < 3$, then $(3X - 1) \in$ ....

(a) $]2 , 8[$ (b) $[2 , 8]$ (c) $]2 , 8]$ (d) $\{2 , 8\}$

2 The range of the set of the values : 7 , 3 , 6 , 5 , 9 is ....

(a) 3 (b) 4 (c) 6 (d) 12

3 Half of the number 4^{20} = ...

(a) 2^{20} (b) 2^{39} (c) 2^{29} (d) 4^{19}

4 If X , Y are two non empty sets and $n(X^2) = 4$, $n(X \times Y) = 6$

, then $n(Y^2)$ = ...

(a) 4 (b) 9 (c) 16 (d) 12

5 If $a \times \frac{b}{3} = \frac{a}{3}$, then b = ...

(a) $-a$ (b) 1 (c) $\frac{a}{3}$ (d) a

6 If $Xy = 7$, then $y \propto$ ....

(a) $\frac{1}{X}$ (b) $X - 7$ (c) X (d) $X + 7$

---

2 **[a]** If $(X + 3 , 9) = (5 , y^2)$, **then find :** the value of each of X and y

[b] If $y \propto \frac{1}{X}$ and y = 4 when $X = 2$, **then find :**

1 The relation between X and y

2 The value of y when $X = 8$

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3 **[a]** If $X = \{0 , 1 , 2 , 3 , 4 , 5 , 6\}$ and R is a relation on X "where a R b" means "a double b" for all $a \in X$, $b \in X$

1 Write R as a set of ordered pairs and show if it is a function or not.

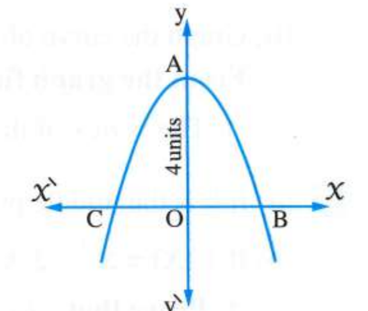
2 Is 2 R 4 ?

3 Find the value of X if 6 R X

[b] If b is the middle proportional between a and c , **then prove that :** $\frac{a - b}{a - c} = \frac{b}{b + c}$

4 [a] The opposite figure represents the curve of the function $f : f(\mathcal{X}) = \text{m} - \mathcal{X}^2$

If OA = 4 units , **then find :**



1 The value of m

2 The coordinates of the two points B and C

3 The area of the triangle whose vertices are A , B , C

[b] If the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(\mathcal{X}) = 2\mathcal{X} + \text{a}$ and $f(3) = 9$, **then find :**

1 The value of a

2 The coordinates of the intersection point of the straight line representing the function with $\mathcal{X}$-axis

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5 [a] If $\frac{\mathcal{X}}{2} = \frac{\text{y}}{3} = \frac{\text{z}}{4} = \frac{2\mathcal{X} - \text{y} + 5\text{z}}{3\text{m}}$, **then find :** the value of m

[b] **Find the standard deviation of the values :** 4 , 8 , 12 , 10 , 6

3 Alexandria Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer from those given :**

1 If $(3 , 5) \in \{3 , 6\} \times \{\mathcal{X} , 8\}$, then $\mathcal{X}$ = ...

(a) 8 (b) 6 (c) 5 (d) 3

2 A quarter of the number 2^8 is ....

(a) 2^6 (b) 2^{10} (c) $\left(\frac{1}{2}\right)^8$ (d) $\left(\frac{1}{2}\right)^6$

3 If $\frac{3\text{a}}{5\text{b}} = \frac{1}{2}$, then $\frac{\text{a}}{\text{b}}$ = ...

(a) $\frac{6}{5}$ (b) $\frac{5}{6}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

4 If $\mathcal{X}$ is an odd number , then the next odd number directly is ....

(a) $\mathcal{X}^2$ (b) $\mathcal{X}^2 + 1$ (c) $\mathcal{X} + 1$ (d) $\mathcal{X} + 2$

5 $\frac{\text{Sum of the values}}{\text{Their number}}$ is ....

(a) the range. (b) the standard deviation.

(c) the mode. (d) the arithmetic mean.

6 If $3 > \mathcal{X} > 1$, $\mathcal{X} \in \mathbb{R}$, then $(3\mathcal{X} - 1) \in$ ....

(a) $\{2 , 8\}$ (b) $]2 , 8[$ (c) $[2 , 8]$ (d) $[2 , 8[$

2 **[a]** If $X = \{2 , 5\}$, $Y = \{1 , 2\}$, $Z = \{3\}$

, find : 1 $n(X \times Z)$ 2 $(Y \cap X) \times Z$

[b] Find the number which if its square is added to each of the two terms of the ratio 5 : 11 it becomes 3 : 5

3 **[a]** If $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ **, find the value of :** $\frac{2y - z}{3x - 2y + z}$

[b] If $X = \{1 , 3 , 4 , 5\}$, $Y = \{1 , 2 , 3 , 4 , 5 , 6\}$, and R is a relation from X to Y where "a R b" means "a + b = 7" for all $a \in X$, $b \in Y$, write the relation R and represent it by an arrow diagram. Is R a function ? and why ?

4 **[a]** If y varies inversely with x , y = 2 when $x = 4$ **, find :**

1 The relation between y and x 2 The value of y when $x = 16$

[b] The following frequency distribution shows the ages of 20 persons :

Ages in years	15	20	22	23	25	30	Total
Number of persons	2	3	5	5	1	4	20

Calculate the standard deviation to ages.

5 **[a]** Represent graphically the function f where $f(x) = 4 - x^2$ taking $x \in [-3 , 3]$ **and from the drawing deduce :**

1 The coordinates of the vertex of the curve.

2 The maximum or the minimum value of the function.

3 The equation of the symmetry axis

[b] If $f(x) = 5x - a$, $r(x) = x - 2a$ and $f(1) + r(3) = -7$, **find :** the value of a

4 El-Kalyoubia Governorate



Answer the following questions :

1 **Choose the correct answer from the given answers :**

1 If the point (5 , b – 7) lies on the x-axis , then b = ...

(a) 2 (b) 5 (c) 7 (d) 12

2 If $f(x) = 7$, then $f(7) + f(-7) =$ ....

(a) 7 (b) – 7 (c) – 14 (d) 14

3 If $\sqrt[3]{-27} = -\sqrt{x}$, then $x =$ ....

(a) 9 (b) – 9 (c) 3 (d) – 3

4 If $\frac{a}{3} = \frac{b}{4}$, then $8a - 6b + 4 =$ ....

(a) 3 (b) 4 (c) 5 (d) 6

5 If $X = \{2\}$, then $X^2 =$ ....

(a) 4 (b) $\{4\}$ (c) (2 , 2) (d) $\{(2 , 2)\}$

6 The positive square root of the average of squares of deviations of the values from their mean is called ....

(a) the mean. (b) the range.

(c) the standard deviation. (d) the mode.

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2 [a] If y varies inversely as x and y = 3 as $x = 2$

1 Find the relation between x and y

2 Find the value of y when $x = \frac{3}{2}$

[b] If $\frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3x}$, **find :** the value of x

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3 [a] If $X = \{1 , 3 , 5\}$, $Y = \{2 , 3 , 4 , 5 , 6\}$ and R is a relation from X to Y , where "a R b" means "a + b = 7" for each $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Is R a function ? and why ?

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a - c}{a - b} = \frac{b + c}{b}$

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4 [a] If $X \times Y = \{(1 , 1) , (1 , 3) , (1 , 5)\}$

, **find :** 1 X , Y

2 $Y \times X$

[b] Represent graphically the function $f : f(x) = 2 - x^2$ since $x \in [-3 , 3]$

and find from the drawing deduce :

1 The coordinates of the vertex of the curve.

2 The maximum value of the function.

3 The equation of the symmetry axis.

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5 [a] If $X = \{1 , 3 , 5\}$ and R is a function on X where $R = \{(a , 3) , (b , 1) , (1 , 5)\}$ **, find :**

1 The range of the function.

2 The numerical value of a + b

[b] **Find the mean and the standard deviation for the following frequency distribution :**

Set	zero –	2 –	4 –	6 –	8 – 10	**Total**
Frequency	1	3	6	5	5	**20**

5 El-Monofia Governorate



Answer the following questions : *(Using calculator is permitted)*

1 **Choose the correct answer :**

1 If $\frac{5}{4}+\frac{5}{x}=\frac{5}{2}$, then $x=$ ....

(a) 2 (b) 4 (c) 5 (d) $\frac{5}{2}$

2 If $x+y=xy=5$, then $x^2y+xy^2=$ ....

(a) 10 (b) 15 (c) 20 (d) 25

3 If $1<x<3$, $x\in\mathbb{R}$, then $(3x-1)\in$ ....

(a) $[2,8[$ (b) $[2,8]$ (c) $]2,8[$ (d) $\{2,8\}$

4 If $\frac{a+2b}{a-b}=\frac{2}{3}$, then $\frac{b}{a}=$ ....

(a) $\frac{1}{8}$ (b) 8 (c) $\frac{-1}{8}$ (d) -8

5 Which of the following values of the number x makes the range of the set of the values x , 15 , 20 , 24 equal to 14 ?

(a) 30 (b) 25 (c) 19 (d) 10

6 If $x\in\mathbb{R}_-$, then the point $\left(-x,\sqrt[3]{x}\right)$ lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

---

2 [a] If $X=\{4,3\}$, $Y=\{5,4\}$ and $Z=\{5,6\}$, **find :**

1 $X\times(Y\cap Z)$ 2 $(X-Y)\times Z$ 3 $n(Z^2)$

[b] If a , b , c and d are in continued proportion , **prove that :** $\frac{ab-cd}{b^2-c^2}=\frac{a+c}{b}$

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3 [a] If $X=\{-2,-1,1,2\}$, $Y=\left\{8,\frac{1}{3},-1,1,-8\right\}$ and R is a relation from X to Y where "a R b" means "$b=a^3$" for each $a\in X$, $b\in Y$

1 Write R and represent it by an arrow diagram.

2 Show that R is a function and find its range.

[b] If the straight line that represents the function f where $f:\mathbb{R}\longrightarrow\mathbb{R}$ where $f(x)=ax+b$ cuts y-axis at the point (0 , 3) and $f(2)=7$,

find : the values of a and b

4 **[a]** Find the number that if its square is added to the terms of the ratio 7 : 11 , then it will become 4 : 5

[b] If y varies inversely as x^2 and $x = 3$ when $y = 4$, **find :**

1. The relation between x and y
2. The value of x when $y = 9$

---

5 **[a]** Draw the curve of the function f where $f(x) = 1 - x^2$ taking $x \in [-3, 3]$ **and from the graph find :**

1. The coordinates of the vertex of the curve.
2. The equation of the axis of symmetry.
3. The area of the triangle whose vertices are the intersection points of the curve with the two axes.

[b] The following frequency distribution shows the number of children of some families in a new city :

Number of children	zero	1	2	3	4
Number of families	8	16	50	20	6

Calculate the mean and the standard deviation of the number of children.

6 El-Gharbia Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer :**

1. The function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = a x + b$ represents a linear function on condition $a \in$ ....

(a) $\mathbb{R}$ (b) $\mathbb{R}_+$ (c) $\mathbb{R} - \{0\}$ (d) $\mathbb{R}_-$

2. The fourth proportional of the numbers : 4 , 12 , 16 is ....

(a) 24 (b) ± 24 (c) 48 (d) ± 48

3. If the weekly wages in pounds of a set of workers in a factory are 170 , 180 , 180 , 230 and 240 , then the median of wages equals ....

(a) 200 (b) 70 (c) 180 (d) 205

4. If $x^2 + y^2 = 6$, $x y = 5$, then $(x + y)^2 =$ ....

(a) 16 (b) ± 16 (c) 11 (d) ± 11

5. The relation which represents the direct variation between y and x is ....

(a) $x y = 5$ (b) $y = 3 - x$ (c) $\frac{x}{3} = \frac{y}{5}$ (d) $\frac{x}{3} = \frac{4}{y}$

6 If $X = \{1 , 3 , 5\}$ and R is a function on X where $R = \{(a , 3) , (b , 1) , (1 , 5)\}$, then the numerical value of $a + b =$ ....

(a) 4 (b) 6 (c) 8 (d) other.

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2 [a] If $X = \{-1 , \text{zero} , 2 , 3\}$, $Y = \{1 , \text{zero} , \frac{1}{2} , \frac{1}{3}\}$ and R is a relation from X to Y where "a R b" means "The number a is the multiplicative inverse of the number b" for each $a \in X$, $b \in Y$, write R , and represent it by an arrow diagram and show if R is a function or not ? And why ?

[b] **From the data of the following table answer the following questions :**

x	2	4	6
y	6	3	2

1 Show the kind of variation between x and y

2 Find the constant proportional.

3 Find the value of y when $x = 3$

---

3 [a] If a , b , c and d are in continued proportion , **prove that :** $\frac{a}{b+d} = \frac{c^3}{c^2 d + d^3}$

[b] If $X = \{6\}$, $Y = \{2 , 3\}$ and $Z = \{2 , 5 , 6\}$, **find :**

1 $n(X^2)$ 2 $(Z - Y) \times (X \cap Z)$

---

4 [a] Two integers the ratio between them is 2 : 3 , if you add to the first 7 and subtract from the second 12 , the ratio between them becomes 5 : 3 , find the two integers.

[b] If the function $f : f(x) = 3x - 6$ represents a straight line passing through the point $(a , 2a)$, find the value of a , and find the intersection point of the straight line with y-axis.

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5 [a] **Calculate the standard deviation for the following data :**

16 , 32 , 5 , 20 , 27 rounding the result to one decimal place.

[b] Represent graphically the function $f : f(x) = (x - 2)^2$, taking $x \in [-1 , 5]$ **and from the graph deduce :**

1 The equation of the axis of symmetry.

2 The maximum value or the minimum value of the function.

7 El-Dakahlia Governorate



Answer the following questions : *(Calculator is permitted)*

1 [a] **Choose the correct answer :**

1 The point $(X - 3 , 2 - X)$ lies in the fourth quadrant , then $X =$ ....

(a) 4 (b) 3 (c) 2 (d) 1

2 If $d(X) = cX + 8$, $d(2) = 0$, then $c =$ ....

(a) 8 (b) 6 (c) 4 (d) -4

3 If a , 2 , 4 , b are in continued proportion , then a + b = ...

(a) 2 (b) 4 (c) 6 (d) 9

[b] If b is the middle proportional between a and c , **prove that :** $\frac{2c^2 - 3b^2}{2b^2 - 3a^2} = \frac{c}{a}$

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2 [a] **Choose the correct answer :**

1 If $y \propto X$, $y \propto \frac{1}{d}$, then $y \propto$ ....

(a) $X d$ (b) $\frac{d}{X}$ (c) $\frac{X}{d}$ (d) $X^2 d$

2 The standard deviation of the values 5 , 5 , 5 , 5 equals ....

(a) zero (b) 5 (c) 6 (d) 2

3 The function $d : d(X) = X^2 - (X - 3)^2$ is of the .... degree.

(a) zero (b) first (c) second (d) third

[b] If $(-1 , 2)$ is the point of the vertex of the curve of the function $d : d(X) = aX^2 - 6X + c$, **find :** the value of c

---

3 [a] If 3 a = 4 b = 6 c , **find :** a : b : c , and the value of : $\frac{3a + 2b}{a + 4c}$

[b] If $X = \{-2 , -1 , 0 , 1 , 2\}$, R is a relation on the set X where "a R b" means "a is the additive inverse of the number b" for every a $\in$ X and b $\in$ X , state R , then represent it by an arrow diagram , and mention giving reasons if R represents a function or not.

---

4 [a] If $X = z + 8$ where z varies inversely as y and z = 2 when y = 3 , find the relation between y and X , **then find :** y when $X = 3$

[b] If $d(X) = 2X + 5$, $r(X) = X - 6$, **prove that :** $d(2) + 3\,r(3) = 0$

---

5 [a] **Calculate the mean and the standard deviation of the following data :** 5 , 7 , 8 , 9 , 6

[b] If $(X - 2 , 3^{y-1}) = (3 , 1)$, **find :** X , y

8 Ismailia Governorate 

Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from those given :**

1 $\sqrt{36} + \sqrt{16} =$ ....

(a) 10 (b) 24 (c) 52 (d) 100

2 The middle proportional between 3 , 27 is ....

(a) 9 (b) – 9 (c) ± 9 (d) 1

3 If $f(X) = 2$, then $f(2) + f(-2) =$ ....

(a) zero (b) 4 (c) – 4 (d) 1

4 The positive number which twice its square equals 50 is ....

(a) 5 (b) 10 (c) 25 (d) 100

5 If $X + y = X y = 5$, then $X^2 y + y^2 X =$ ....

(a) 10 (b) 15 (c) 20 (d) 25

6 The simplest and easiest method of measuring dispersion is ....

(a) the range. (b) the standard deviation.

(c) the arithmetic mean. (d) the mode.

---

2 **[a]** If $X = \{2 , 3 , 5\}$, $Y = \{4 , 6 , 8 , 10\}$ and R is a relation from X to Y where "a R b" means "2 a = b" for all $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Is the relation R a function ? Why ? and if it's a function , find its range.

[b] The ratio between two integers is 3 : 7 If 5 is subtracted from each of them , then the ratio becomes 1 : 3 , find the two integers.

---

3 **[a]** As Yousef was reading a book , he found out after 3 hours 50 pages remained , after 6 hours 20 pages remained. If there was a relation between the time (t) and the number of pages (y) Is a linear relation.

1 Represent the relation between (t) and (y) , then find the algebraic relation between them.

2 How much time did Yousef takes to finish reading the book ?

3 How many pages left when Yousef started reading ?

[b] If X , y , z and ℓ are proportional quantities , **prove that :** $\frac{y - X}{X} = \frac{\ell - z}{z}$

4 [a] If $y \propto X$ and $y = 40$ at $X = 14$, find the relation between X and y , then find the value of X when $y = 80$

[b] If $X \times Y = \{(1, 2), (1, 3), (2, 2), (2, 3)\}$
, **find :** 1 $X \cup Y$ 2 $n(Y^2)$

---

5 [a] Represent graphically the function $f : f(X) = (X - 2)^2$, taking $X \in [-1, 5]$
And from the graph find :

1 The coordinates of the vertex of the curve. 2 The equation of the line of symmetry.

3 The maximum or the minimum value of the function.

[b] **Find the standard deviation for the following set of values :** 13 , 14 , 17 , 19 , 22



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from those given :**

1 If $(2, 3) \in \{2, 5\} \times \{X, 6\}$, then $X =$ ....

(a) 6 (b) 5 (c) 3 (d) 2

2 $(\sqrt{5} - 3)(\sqrt{5} + 3) =$ ....

(a) 8 (b) 2 (c) 4 (d) – 4

3 The positive square root of the mean of the squares of deviations of the values from their arithmetic mean is called ....

(a) the range. (b) the arithmetic mean.

(c) the standard deviation. (d) the mode.

4 If the number $\frac{3}{b} + 1 = 4$, then b = ... where $b \neq 0$

(a) 1 (b) 2 (c) 3 (d) 4

5 $\mathbb{Z}_{-} \cup \mathbb{N} =$ ....

(a) $\varnothing$ (b) $\mathbb{Z}$ (c) $\mathbb{N}$ (d) $\mathbb{R}$

6 If $\frac{a}{b} = \frac{c}{d} = m$ (where $m \in \mathbb{R}^*$) , then $\frac{ac}{bd} =$ ....

(a) m (b) m^2 (c) 2 m (d) $2\ m^2$

---

2 [a] If $X = \{1, 2, 3\}$, $Y = \{1, 4, 6, 9\}$ and R is a relation from X to Y where "a R b" means "$a = \sqrt{b}$" for all $a \in X$, $b \in Y$

1 Find the relation R 2 Represent the relation R by an arrow diagram.

3 Is R a function ? Why ?

[b] If b is the middle proportional between a and c , **prove that :** $\frac{2c^2 - 3b^2}{2b^2 - 3a^2} = \frac{c}{a}$

3 [a] If $(2\mathcal{X}, 4) = (8, y + 1)$, **find :** $\sqrt{\mathcal{X}^2 + y^2}$

[b] If $y \propto \mathcal{X}$ and $y = 2$ when $\mathcal{X} = 8$, **find :**

1 The relation between y and $\mathcal{X}$

2 The value of y when $\mathcal{X} = 12$

---

4 [a] Draw the curve of the function $f : f(\mathcal{X}) = \mathcal{X}^2 + 1$, taking $\mathcal{X} \in [-2, 2]$

and from the graph find :

1 The coordinates of the vertex of the curve.

2 The equation of the axis of symmetry.

3 The minimum value.

[b] If $\frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3\mathcal{X}}$, **find :** $\mathcal{X}$

---

5 [a] If $X = \{1, 3, 5\}$ and R is a function on X where $R = \{(a, 3), (b, 1), (1, 5)\}$, **find :**

1 The range of the function.

2 The numerical value of the expression a + b

[b] **Calculate the standard deviation for the values :** 8, 9, 7, 6, 5

10 Port Said Governorate



Answer the following questions :

1 **Choose the correct answer from those given :**

1 $[1, 3] - \{0, 1\} =$ ....

(a) $]1, 3[$ (b) $]1, 3]$ (c) $[1, 3[$ (d) $\{3\}$

2 If $2^{\mathcal{X}} = 2^6$, then $\mathcal{X} =$ ....

(a) 3 (b) 4 (c) 6 (d) 64

3 20% from 10 pounds = ... pounds.

(a) 2 (b) 2.5 (c) 5 (d) 20

4 If $n(X) = 3$, $n(X \times Y) = 12$, then $n(Y) =$ ....

(a) 4 (b) 9 (c) 15 (d) 36

5 If $3a = 4b$, then $a : b =$ ....

(a) 3 : 4 (b) 4 : 7 (c) 3 : 7 (d) 4 : 3

6 The range of the set of the values 7, 3, 6, 9 and 5 equals ....

(a) 3 (b) 4 (c) 6 (d) 12

2 [a] If $X = \{2, 3, 4\}$, $Y = \{2, 3, 4, 5, 6, 7, 8\}$, R is a relation from X to Y where "a R b" means "$a = \frac{1}{2}$ b" for each $a \in X$, $b \in Y$, write R and represent it by an arrow diagram. Show that R is a function from X to Y and find its range.

[b] If $f(x) = 4x + b$ and $f(3) = 15$, **find :** the value of b

---

3 [a] If $f(x) = x^2 - 3x$, $g(x) = x - 3$

1 **Find :** $f(\sqrt{2}) + 3g(\sqrt{2})$ 2 **Prove that :** $f(3) = g(3) = 0$

[b] Represent graphically the quadratic function f where $f(x) = x^2$, $x \in \mathbb{R}$, consider $x \in [-3, 3]$, from the graph deduce the vertex of the curve , the minimum value of the function , the equation of the axis of symmetry.

---

4 [a] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

[b] If $y \propto x$, where $y = 14$ when $x = 42$, **then find :**

1 The relation between x and y 2 The value of y when $x = 60$

---

5 [a] **Calculate the standard deviation for the values :** 16 , 32 , 5 , 20 , 27

[b] If the height of a right constant cylinder (constant volume) is (h) varies inversely as the square of its radius length r and h = 27 cm. when r = 10.5 cm. , find h when r = 15.75 cm.

11 Damietta Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer from the given ones :**

1 If $n(X) = 3$, $n(Y^2) = 4$, then $n(X \times Y) =$ ....

(a) 6 (b) 12 (c) 18 (d) 36

2 The range of the set of the values 7 , 4 , 6 , 9 and 5 equals ....

(a) 3 (b) 4 (c) 5 (d) 6

3 If $\frac{y}{x} = 5$, then $y \propto$ ....

(a) x (b) $\frac{1}{x}$ (c) $x - 5$ (d) $x + 5$

4 If $\frac{3}{4} + \frac{3}{x} = \frac{3}{2}$, then $x =$ ....

(a) $\frac{3}{2}$ (b) 2 (c) 3 (d) 4

5 The third proportional of the two numbers 3 and 6 is ....

(a) $\frac{1}{2}$ (b) 2 (c) 9 (d) 12

6 The solution set of the equation $(x-1)^2 = 9$ in $\mathbb{R}$ is ....

(a) $\{4\}$ (b) $\{-2\}$ (c) $\{4, -2\}$ (d) $\{3\}$

---

2 [a] If $X = \{1, 9, 6\}$, $Y = \{3, 4, 5, 6\}$, $Z = \{4\}$, **then find :** $(X - Y) \times Z$

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

---

3 [a] If $y \propto \frac{1}{x}$ and $y = 3$ when $x = 2$

1 Find the relation between x and y

2 Find the value of y when $x = 1.5$

[b] If $\frac{y}{x - z} = \frac{x}{y} = \frac{x + y}{z}$, **prove that :**

1 Each ratio is equal to 2 (unless $x + y = 0$)

2 $3y = 2z$

---

4 [a] If $(x^3, y + 1) = (8, 3)$, **find the value of :** $\sqrt[3]{x + 3y}$

[b] If $X = \{-1, 0, 2, 3\}$, $Y = \{0, 1, 4, 6, 9\}$ and R is a relation from X to Y where "a R b" means "$a^2 = b$" for each $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram

2 Show that R is a function from X to Y and find its range.

---

5 [a] **Calculate the arithmetic mean and the standard deviation of the set of values :**

72 , 53 , 61 , 70 , 59

[b] Represent graphically the function $f : f(x) = x^2 - 2$, $x \in [-3, 3]$

From the graph deduce : 1 The vertex of the curve.

2 The equation of the axis of symmetry.

12 Kafr El-Sheikh Governorate



Answer the following questions : *(Calculators are permitted)*

1 Choose the correct answer from those given :

1 If $X =]-\infty, 0[$, then $X` = $ ....

(a) $\mathbb{R}_+$ (b) $[0, \infty[$ (c) $]-\infty, 0]$ (d) $\mathbb{R}_-$

2 The function $f : f(x) = (x-2)^2 - x^2$ is of the .... degree.

(a) first (b) second (c) third (d) fourth

3 If $\sum (x-\overline{x})^2 = 36$ of a set of values and the number of these values = 9 , then σ = ...

(a) 2 (b) 18 (c) 27 (d) 4

4 The middle proportional between $3x^3$ and $27x$ is ....

(a) $9x^2$ (b) $\pm 9x^4$ (c) $\pm 9x^2$ (d) $9x^4$

5 If $y^2 + 4x^2 = 4xy$, then ....

(a) $y \propto x$ (b) $y \propto x^2$ (c) $y \propto \frac{1}{x}$ (d) $y \propto \frac{1}{x^2}$

6 If $\{2\} \times \{x , y\} = \{(2 , 4) , (2 , 3)\}$, then $x - y$ = ...

(a) 1 (b) – 1 (c) ± 1 (d) zero

---

2 [a] If $X = \{-1 , 1 , 2\}$, $Y = \{2 , 4 , 6 , 8\}$ and R is a relation from X to Y , where "a R b" means "b = 2 a + 4" for each $a \in X$, $b \in Y$, write R and represent it by an arrow diagram , and show if R is a function or not ? If R is a function mention its range.

[b] If $\frac{21x - y}{7x - z} = \frac{y}{z}$, **prove that :** $y \propto z$

---

3 [a] Represent graphically the function $f : f(x) = x^2 - 2x$, $x \in [-2 , 4]$

and from the graph deduce :

1 The equation of the line of symmetry.

2 The maximum or the minimum value of the function.

[b] If a , b , c and d are in continued proportion , **prove that :** $\frac{a}{b+d} = \frac{c^3}{c^2 d + d^3}$

---

4 [a] If $\frac{x+y}{3} = \frac{y+z}{8} = \frac{z+x}{6}$, **prove that :** $\frac{x+y+z}{2x+3y+3z} = \frac{17}{50}$

[b] If the point (a , 4) is one of the points of the function $g : \mathbb{R} \longrightarrow \mathbb{R}$ where $g(x) = 2x + b$, **then find the value of :** 6 a + 3 b

---

5 [a] **The following table represents the daily wages of a set of workers in a factory :**

Set of wages	20 –	30 –	40 –	50 –	60 –	70 –
Number of workers	10	12	8	6	3	1

Find the mean and the standard deviation of the wages.

[b] If the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$, $f(x) = a x + b$ cuts from the positive part of y-axis 3 length units and passes through the point (1 , 5) , **find :** the value of each of a , b

13 El-Beheira Governorate



Answer the following questions : *(Calculator is permitted)*

1 **Choose the correct answer from the given ones :**

1 If $3^{x} = 9^2$, then $x =$ ....

(a) 3 (b) 4 (c) 6 (d) 64

2 The range of the set of the values 7 , 3 , 6 , 8 and 5 equals ....

(a) 3 (b) 8 (c) 11 (d) 5

3 If the point $(x - 4 , 2 - x)$ where $x \in \mathbb{Z}$ is located in the third quadrant , then $x =$ ....

(a) 2 (b) 3 (c) 4 (d) 6

4 The relation which represents the direct variation between the two variables x and y is ....

(a) $x y = 7$ (b) $y = x + 5$ (c) $\frac{x}{3} = \frac{7}{y}$ (d) $\frac{x}{2} = \frac{y}{5}$

5 The solution set of the equation $x^2 - 25 = 0$ in $\mathbb{R}$ is ....

(a) $\{5 , -5\}$ (b) $[-5 , 5]$ (c) 5 (d) -5

6 If $(3 , 5) \in \{3 , 6\} \times \{y , 8\}$, then y = ...

(a) 8 (b) 6 (c) 5 (d) 3

---

2 **[a]** If $X = \{2 , 3 , 5\}$, $Y = \{4 , 6 , 8 , 10\}$ and R is a relation from X to Y where "a R b" means "2 a = b" for all $a \in X$, $b \in Y$

1 Write R

2 Show that R is a function and find its range.

[b] If b is the middle proportional between a and c , **then prove that :** $\frac{2 c^2 - 3 b^2}{2 b^2 - 3 a^2} = \frac{c}{a}$

---

3 **[a]** If $y \propto \frac{1}{x}$ and y = 9 when $x = 2$, **find :**

1 The relation between y and x

2 The value of y when $x = 3$

[b] If $f(x) = 5x + a$ and $f(2) = 12$, **find :** the value of a

---

4 **[a]** If $X = \{3 , 4\}$, $Y = \{4 , 5\}$, $Z = \{6 , 5\}$, **find :**

1 $(X - Y) \times Z$

2 $n(X \times Y)$

[b] Find the number that if subtracted thrice of it from each of the two terms of the ratio $\frac{49}{69}$ the ratio becomes $\frac{2}{3}$

5 [a] **Calculate the mean and the standard deviation of the following data :**

8 , 13 , 20 , 16 , 18 , 21

[b] Represent graphically the function f where $f(X) = 3 - X^2$, where $X \in [-3 , 3]$ **and from the graph deduce :**

1 The equation of the symmetry axis.   2 The maximum value of the function.

14 El-Fayoum Governorate



Answer the following questions : ***(Using calculators is allowed)***

1 **Choose the correct answer :**

1 If $\left(X + 1 , \sqrt[3]{27}\right) = (-1 , y)$, then the point (X , y) lies in the .... quadrant.

(a) first   (b) second   (c) third   (d) fourth

2 If $\frac{3}{4} + \frac{3}{X} = \frac{3}{2}$, then $X =$ ....

(a) 2   (b) 4   (c) 3   (d) $\frac{3}{2}$

3 Twice of the number 2^8 is ....

(a) 2^{10} (b) 2^{16} (c) 2^4 (d) 2^9

4 If $X y = 12$, then y varies directly as ....

(a) $\frac{1}{X}$ (b) $X - 12$ (c) X (d) $X + 12$

5 Omar bought 4 notebooks and 3 pens , he paid 50 pounds for them. If the price of a pen is twice the price of a notebook , then the price of a notebook is .... pounds.

(a) 4   (b) 5   (c) 10   (d) 20

6 If the range of the set of the values 7 , X , 8 , 9 and 5 is 6 , then $X =$ ....

(a) 3   (b) 4   (c) 6   (d) 12

---

2 [a] If $X = \{2 , 5\}$, $Y = \{1 , 2\}$, $Z = \{3\}$, **find :**

1 $n(X \times Y)$ 2 $(Y \cap X) \times Z$

[b] If a = 2 b , **find the value of :** $\frac{8a + 5b}{7a - 2b}$

---

3 [a] If $X = \{1 , 2 , 3\}$, $Y = \left\{1 , \frac{1}{2} , \frac{1}{3} , \frac{1}{4}\right\}$ and $R : X \longrightarrow Y$, where "a R b" means "a is the multiplicative inverse of b" for all $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram

2 Is R a function ? Write its range.

[b] If $f(X) = 4X + a$, $f\left(\frac{1}{4}\right) = 12$, **find :** the value of a

4 [a] If a , b , c and d are in continued proportion , **prove that :** $\frac{a}{b+d} = \frac{c^3}{c^2 d + d^3}$

[b] If y varies inversely as X , and y = 3 when $X = 2$

1 Find the relation between X and y   2 Find the value of y when $X = 3$

5 [a] Graph the function f where $f(X) = 4 - X^2$, $X \in [-3 , 3]$, **from the graph determine :**

1 The coordinates of the vertex of the curve.

2 The equation of the symmetry axis of this function.

[b] **Calculate the mean and the standard deviation of the following data :**

3 , 6 , 7 , 9 , 15

15 Beni Suef Governorate



Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1 The middle proportional between a and c equals ....

(a) $\sqrt{a+c}$ (b) $\frac{a+c}{2}$ (c) $\pm\sqrt{a\,c}$ (d) a c

2 The difference between the greatest value and the smallest value of a set of data is called ....

(a) the range. (b) the arithmetic mean.

(c) the mode. (d) the standard deviation.

3 $|\sqrt[3]{-8}|$ = ...

(a) 4 (b) 2 (c) – 2 (d) ± 2

4 $\frac{7}{X}$ is a rational number if $X \neq$ ....

(a) 7 (b) – 7 (c) 1 (d) zero

5 If the point (a , 3 – a) lies on the X-axis , then a = ...

(a) zero (b) 3 (c) – 3 (d) 5

6 If $-X > 3$, then $X \in$ ....

(a) $\{-3\}$ (b) $]3 , \infty[$ (c) $]-\infty , 3[$ (d) $]-\infty , -3[$

2 [a] If X = {2 , 5} , Y = {3 , 2} , Z = {3} , **find :**

1 X × Z   2 Y^2 3 $(X \cap Y) \times Z$

[b] Find the positive number which if we add its square to each of the two terms of the ratio 5 : 11 it becomes 3 : 5

3 [a] If $f(X) = X^2 - \sqrt{2}\,X$, $g(X) = X + 1$

1 **Find :** $f(3) + 3\,g(\sqrt{2})$

2 **Prove that :** $f(\sqrt{2}) = g(-1)$

[b] If y varies inversely with X and y = 3 when $X = 2$, **find :**

1 The relation between X and y

2 The value of y when $X = 1.5$

---

4 [a] If $X = \{1, 2, 3\}$, $Y = \{6, 7, 8\}$ and R is a relation from X to Y where "a R b" means "a + b = 8" for all $a \in X$ and $b \in Y$, write R and represent it by an arrow diagram. Is R a function ? Why ?

[b] If $\frac{X}{3} = \frac{y}{4} = \frac{z}{5}$, **prove that :** $\frac{2y - z}{3X - 2y + z} = \frac{1}{2}$

---

5 [a] **Calculate the arithmetic mean and the standard deviation of the following values :**
7 , 16 , 13 , 9 , 5

[b] Represent graphically the function $f : f(X) = X^2 - 2X$ where $X \in [-1, 3]$ and from the drawing deduce the equation of the axis of symmetry and the maximum or minimum value of the function.

16 El-Menia Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer from the given ones :**

1 $(\sqrt{7} - \sqrt{5})(\sqrt{7} + \sqrt{5}) = \dots\dots$

(a) 2 (b) 12 (c) $2\sqrt{7}$ (d) $-2\sqrt{5}$

2 If $X y = 3$, then $y \propto \dots\dots$

(a) X (b) $X - 3$ (c) $\frac{1}{X}$ (d) $X + 3$

3 $[1, 3] - \{0, 1\} = \dots\dots$

(a) $]1, 3[$ (b) $]1, 3]$ (c) $[1, 3[$ (d) $\{3\}$

4 The arithmetic mean of the set of values 8 , 9 , 7 , 6 and 5 equals $\dots\dots$

(a) 5 (b) 2 (c) 3 (d) 7

5 20% of 10 pounds = $\dots\dots$ pounds.

(a) 2 (b) 2.5 (c) 5 (d) 20

6 If the point $(X - 4, 2 - X)$ where $X \in \mathbb{Z}$ is located in the third quadrant , then $X = \dots\dots$

(a) 2 (b) 3 (c) 4 (d) 6

2 [a] **Find the standard deviation of the values :** 6 , 8 , 10 , 12 and 14

[b] If $X = \{2, 5\}$, $Y = \{1, 2\}$, $Z = \{3\}$, **find :**

1 $n(X \times Z)$ 2 $(Y \cap X) \times Z$

3 [a] If $y \propto \frac{1}{x}$ and y = 3 when $x = 2$, **find :**

1 The relation between x and y 2 The value of y when $x = 1.5$

[b] If $X = \{1, 3, 4, 5\}$, $Y = \{1, 2, 3, 4, 5, 6\}$ and R is a relation from X to Y where "a R b" means "a + b = 7" for each $a \in X$, $b \in Y$, write R and represent it by an arrow diagram. Show if R is a function from X to Y or not. Give the reason.

4 [a] If $\frac{x}{y} = \frac{2}{3}$, **find the value of the ratio :** $\frac{3x + 2y}{6y - x}$

[b] If the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 4x - a$ is represented graphically by a straight line intersecting the x-axis at the point (2 , b) , **find :** a , b

5 [a] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

[b] Represent graphically the following function and from the drawing deduce the coordinates of the curve , and the equation of the symmetry axis and the minimum or the maximum value of the function $f : f(x) = x^2 - 2$, where $x \in [-3, 3]$

17 Assiut Governorate



Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer :**

1 $]2, 5] \cup \{2\} =$ ....

(a) $]2, 5[$ (b) $[2, 5[$ (c) $]-\infty, \infty[$ (d) $[2, 5]$

2 $\sqrt{10^2 - 8^2} =$ ....

(a) 8 (b) 6 (c) 4 (d) 2

3 The solution set of the equation : $x(x - 1) = 0$ in $\mathbb{R}$ is ....

(a) $\{0\}$ (b) $\{1\}$ (c) $\{0, 1\}$ (d) $\varnothing$

4 If 3 a = 8 b , then a : b = ...

(a) – 8 : 3 (b) 8 : 3 (c) 3 : 8 (d) – 3 : 8

5 If x y = 5 , then $y \propto$ ....

(a) $\frac{1}{x}$ (b) $x - 5$ (c) x (d) $\frac{1}{y}$

6 If a regular die is thrown once , then the probability of appearance of an odd number is ....

(a) zero (b) $\varnothing$ (c) 1 (d) $\frac{1}{2}$

---

2 [a] If $X = \{1 , 5 , 6\}$, $Y = \{2 , 4 , 5\}$, find $X \times Y$ and represent it by an arrow diagram.

[b] Represent graphically the quadratic function $f : f(X) = X^2 - 1$, $X \in [-2 , 2]$, **from the graph deduce :**

1 The equation of the axis of symmetry.

2 The maximum value or the minimum value of the function.

---

3 [a] If $f(X) = 4X + m$, $f(3) = 15$, **find :** the value of m

[b] If $\frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3X}$, **then find :** the value of X

---

4 [a] If $y \propto X$, y = 3 when $X = 2$, **find :**

1 The relation between y , X

2 The value of y when $X = \frac{1}{3}$

[b] If b is the middle proportional between a and c , **then prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

---

5 [a] If $X = \{1 , 3 , 5\}$, $Y = \{2 , 3 , 4 , 6\}$ and R is a relation from X to Y where "a R b" means "a + b = 7" for each $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Show if R is a function or not. If R is a function , find its range.

[b] **Calculate the mean and the standard deviation for the values :** 8 , 9 , 7 , 6 , 5

18 Souhag Governorate



Answer the following questions : ***(Calculators are allowed)***

1 Choose the correct answer :

1 The simplest dispersion measure is ....

(a) the mean. (b) the median. (c) the range. (d) the mode.

2 20% from 100 pounds = ... pounds.

(a) 5 (b) 10 (c) 15 (d) 20

3 $[3 , 7] - \{3 , 7\} =$ ....

(a) $[3 , 7[$ (b) $]3 , 7]$ (c) $]3 , 7[$ (d) $[3 , 7]$

4 The solution set of the equation : $x^2 - 9 = 0$ in $\mathbb{R}$ is ....

(a) $\{-3\}$ (b) $\{3\}$ (c) $\{-3 , 3\}$ (d) $\varnothing$

5 If n (X) = 5 , n (X × Y) = 10 , then n (Y) = ...

(a) 4 (b) 3 (c) 2 (d) 1

6 The relation representing the direct variation between the two variables y and x is ....

(a) $x y = 5$ (b) $y = x + 3$ (c) $\frac{x}{3} = \frac{4}{y}$ (d) $\frac{x}{5} = \frac{y}{2}$

---

2 [a] If $\frac{x}{y} = \frac{3}{4}$, **find the value of :** $\frac{3x + y}{x + 5y}$

[b] If $X = \{1 , 2 , 3\}$, $Y = \left\{1 , \frac{1}{2} , \frac{1}{3} , \frac{1}{5}\right\}$ and R is a relation from X to Y where "a R b" means "a is the multiplicative inverse of b" for all $a \in X$, $b \in Y$, write R and represent it by an arrow diagram. Is R a function ? Why ?

---

3 [a] If $X = \{4 , 5 , 7\}$, R is a function on X and $R = \{(a , 5) , (b , 5) , (4 , 7)\}$, **find :**

1 The value of a + b 2 The range of the function.

[b] Represent graphically the function $f : f(x) = 2 - x^2 , x \in [-3 , 3]$,

from the graph deduce :

1 The coordinates of the vertex point of the curve.

2 The equation of the axis of symmetry.

3 The maximum value of the function.

---

4 [a] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

[b] **From the data of the following table , answer the following questions :**

x	2	4	6
y	6	3	2

1 Show the kind of variation between y and x

2 Find the constant proportional.

3 Find the value of y when $x = 2\frac{2}{5}$

---

5 [a] If the point (a , 3) is located on the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 4x - 5$, **find :** the value of a

[b] **Find the standard deviation of the set of the values :** 15 , 19 , 20 , 21 , 25

19 Qena Governorate



Answer the following questions : ***(Calculators are permitted)***

1 Choose the correct answer from those given :

1 The ordered pair (x^2, y^2), where $x \neq 0$, $y \neq 0$ lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

2 The positive square root of mean of the squares of deviations of the values from their arithmetic mean is called ....

(a) the range. (b) the median.

(c) the standard deviation. (d) the mode.

3 If x and $x + 17$ are two prime numbers , then $x =$ ....

(a) 1 (b) 2 (c) 3 (d) 5

4 If $x y = 5$, then $y \propto$ ....

(a) x (b) $\frac{1}{x}$ (c) x^2 (d) $\frac{1}{x^2}$

5 If $X = \{3\}$, then $n(X^2) =$ ....

(a) 1 (b) 9 (c) $\{(3, 3)\}$ (d) 3

6 The ratio between the area of a square of side length ℓ and the area of a square of side length 3ℓ equals ....

(a) 1 : 3 (b) 3 : 1 (c) 1 : 9 (d) 9 : 1

---

2 [a] If $X = \{1, 2, 3\}$, $Y = \{0, 1, 2, 3, 4\}$ and R is a relation from X to Y where "a R b" means "b – a = 1" for all $a \in X$, $b \in Y$, write R and represent it by an arrow diagram. Show that R is a function and write its range.

[b] If $\frac{a}{4} = \frac{b}{5} = \frac{c}{3}$, **prove that :** $\frac{a - b + c}{a + b - c} = \frac{1}{3}$

---

3 [a] If $y \propto x$, $y = \frac{5}{6}$ when $x = \frac{1}{6}$, write the relation between y and x , then find the value of x when y = 15

[b] If the point (a , – a) lies on the straight line that represents the function $f : f(x) = x - 6$, **find :** the value of a

---

4 [a] If y is the middle proportional between x and z , **prove that :** $\frac{x z}{y (y + z)} = \frac{x}{x + y}$

[b] If $X = \{2, 3\}$, $Y = \{5\}$, $Z = \{4, 5\}$, **find :**

1 $(X - Y) \times Z$ 2 $X \times (Y \cap Z)$

5 [a] Represent graphically the function $f : f(X) = (X-3)^2$, $X \in [0, 6]$,
from the graph find :

1 The vertex of the curve. 2 The maximum or minimum value of the function.

[b] **Calculate the arithmetic mean and the standard deviation for the following data :**
73 , 54 , 62 , 71 , 60

20 Luxor Governorate



Answer the following questions :

1 **Choose the correct answer :**

1 $\frac{1}{3}$ of the number 3^4 = ...

(a) 3 (b) 3^2 (c) 3^3 (d) 2^3

2 If $n(X^2) = 4$, $n(X \times Y) = 6$, then $n(Y^2)$ = ...

(a) 12 (b) 9 (c) 6 (d) 3

3 $]4, 6[\cap \{4, 6\}$ = ...

(a) $\{5\}$ (b) $[4, 6]$ (c) $\{4, 6\}$ (d) $\varnothing$

4 If X , y , z are in continued proportion , then X = ...

(a) $\pm\sqrt{yz}$ (b) yz (c) $\frac{y^2}{z}$ (d) $\frac{y}{z}$

5 $\sqrt[3]{64} = \sqrt{\ldots\ldots}$

(a) 2 (b) 16 (c) 8 (d) 4

6 If all the values are equal , then ....

(a) $X - \overline{X} > 0$ (b) $X - \overline{X} < 0$ (c) $\overline{X} = 0$ (d) $\sigma = 0$

2 [a] If $X = \{2, 1\}$, $Y = \{4, 0\}$, $Z = \{4, 5, -2\}$, **find :**

1 $X \times Y$ 2 $(Y \cap Z) \times X$ 3 $n(Y^2)$

[b] Find the number which if subtracted from the first term of the ratio 15 : 13 and added to the second term , then it becomes 3 : 4

3 [a] If $f(X) = 2X + a$, $g(X) = X^2 + a$ and if $f(2) + g(-4) = 30$, **find :** the value of a

[b] If a , b , c and d are proportional quantities , **prove that :** $\frac{a+c}{b+d} = \frac{a^2+c^2}{ab+cd}$

4 [a] If $X = \{0, 1, 2, \frac{1}{2}\}$ and R is a relation on X where "a R b" means "a is the multiplicative inverse of b" for each $a \in X$, $b \in X$, write R and represent it by an arrow diagram. Is R a function or not ?

[b] If y $\propto x^3$ and y = 64 when $x = 2$, **find :**

1 The relation between x and y

2 The value of y when $x = \frac{1}{2}$

---

5 **[a] Calculate the mean and the standard deviation for the values :** 22 , 20 , 20 , 20 , 18

[b] Represent graphically the function $f : f(x) = x^2 - 4x + 5$ where $x \in [0 , 4]$

, then from the graph find :

1 The equation of the axis of symmetry.

2 The maximum or the minimum value of the function.

21 Aswan Governorate



Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer :**

1 If n $(X^2) = 9$, n $(X \times Y) = 6$, then n (Y) = ...

(a) 2 (b) 3 (c) 4 (d) 6

2 If x y = 3 , then y $\propto$ ....

(a) $3x$ (b) $\frac{3}{x}$ (c) $\frac{1}{x}$ (d) $\frac{x}{3}$

3 $[2 , 5] - \{2 , 5\}$ = ...

(a) $[1 , 6]$ (b) $\varnothing$ (c) $]2 , 5[$ (d) $\{0\}$

4 $\sqrt{50} - \sqrt{8}$ = ...

(a) $\sqrt{200}$ (b) $\sqrt{98}$ (c) $\sqrt{42}$ (d) $\sqrt{18}$

5 If $\sum \left(x - \overline{x}\right)^2 = 48$ of a set of values and the number of these values = 12 , then σ = ...

(a) – 2 (b) 2 (c) 4 (d) 6

6 If $x - y = 5$, $x + y = \frac{1}{5}$, then $x^2 - y^2$ = ...

(a) $\frac{1}{25}$ (b) 1 (c) 5 (d) 25

---

2 **[a]** If X = $\{1 , 3 , 4 , 5\}$, Y = $\{1 , 2 , 3 , 4 , 5 , 6\}$ and R is a relation from X to Y where "a R b" means "a + b = 7" for each a $\in$ X , b $\in$ Y

1 Write R and represent it by an arrow diagram.

2 Is R a function ? and why ?

[b] If y $\propto x$ and y = 6 when $x = 3$, **find :**

1 The relation between x and y

2 The value of y when $x = 5$

3 [a] Represent graphically the function $f : f(X) = 4 - X^2$, taking $X \in [-3 , 3]$ and from the graph deduce : the coordinates of the vertex point of the curve , the maximum value of the function and the equation of line of symmetry.

[b] Find the positive number which if its square is added to the antecedent of the ratio 29 : 46 and subtracted its square from its consequent the ratio becomes 3 : 2

4 [a] If the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$, $f(X) = 6X - a$ intersects the y-axis at the point (b , 2) , **find :** the value of each of a and b

[b] **The following frequency distribution shows the marks of a number of students in an exam :**

Marks	0	1	2	3	4	5	6
Number of students	3	4	6	9	5	3	4

Find the standard deviation of the marks.

5 [a] If $X = \{1 , 3 , 5\}$ and R is a function on X where $R = \{(a , 3) , (b , 1) , (1 , 5)\}$, **find :**

1 The range of the function.
2 The value of a + b

[b] If a , b , c and d are proportional quantities , **prove that :** $\frac{a}{b-a} = \frac{c}{d-c}$

22 New Valley Governorate



Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1 The next in the pattern : $\sqrt{3}$, $\sqrt{12}$, $\sqrt{27}$, $\sqrt{48}$ is ....

(a) $\sqrt{50}$ (b) $\sqrt{75}$ (c) $\sqrt{60}$ (d) $\sqrt{90}$

2 The point (– 3 , 4) lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

3 If y varies inversely with X , and $X = \sqrt{3}$ when $y = \frac{2}{\sqrt{3}}$, then the constant proportional equals ....

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) 2 (d) 6

4 If the point (a , 3) is located on the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(X) = 4X - 5$, then a = ...

(a) 2 (b) 3 (c) 4 (d) 5

5 .... is one of the measures of the dispersion.

(a) The median (b) The arithmetic mean
(c) The standard deviation (d) The mode

6 If $(X+1)^2$ is one of the linear factors of the expression $(X^2-1)^2$, then the other factor is ....

(a) $(X-1)^2$ (b) $(X-1)$ (c) (X^2+1) (d) (X^2-1)

---

2 [a] If $X=\{2, 3, 5\}$, $Y=\{4, 6, 8, 10\}$ and R is a relation from X to Y where "a R b" means "2 a = b" for all $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram. 2 Show that R is a function.

[b] If $\frac{X}{y}=\frac{2}{3}$ **, find the value of the ratio :** $\frac{3X+2y}{6y-X}$

---

3 [a] If $X \times Y=\{(1, 1), (1, 3), (1, 5)\}$ **, then find :**

1 X , Y 2 $Y \times X$ 3 Y^2

[b] If $\frac{21X-y}{7X-z}=\frac{y}{z}$ **, then prove that :** $y \propto z$

---

4 [a] If $f(X)=4X+b$ and $\frac{1}{3} f(3)=5$ **, find :** the value of b

[b] If a , b , c and d are in continued proportion **, then prove that :** $\frac{a^2-3c^2}{b^2-3d^2}=\frac{b}{d}$

---

5 [a] **Calculate the standard deviation for the values :** 12 , 13 , 16 , 18 , 21

[b] Represent graphically the function $f: f(X)=(X-3)^2$, $X \in [0, 6]$, from the graph deduce the vertex of the curve , the minimum value of the function , the equation of the axis of symmetry.

23 South Sinai Governorate



Answer the following questions :

1 **Choose the correct answer from the given answers :**

1 If $(2, 3) \in \{2, 5\} \times \{X, 4\}$, then $X=$ ....

(a) 2 (b) 3 (c) 4 (d) 5

2 If $Xy=5$, then $y \propto$ ....

(a) $\frac{1}{X}$ (b) X (c) $X-5$ (d) $X+5$

3 .... is one of the measures of the dispersion.

(a) The arithmetic mean (b) The median

(c) The mode (d) The standard deviation

4 The mean of the values 1 , 2 , 3 , 4 and 5 equals ....

(a) 5 (b) 4 (c) 3 (d) 2

5 $\sqrt[3]{x^6} = \sqrt{\cdots\cdots\cdots}$

(a) x^4 (b) x^3 (c) x^2 (d) x

6 If $\frac{5}{4} + \frac{5}{a} = \frac{5}{2}$, then a = ...

(a) $\frac{5}{2}$ (b) $-\frac{5}{2}$ (c) 4 (d) -4

2 **[a]** If $X = \{1\}$, $Y = \{2, 3\}$, $Z = \{2, 5, 6\}$,

find : 1 $X \times (Y \cap Z)$ 2 $n(X \times Y)$ 3 $Z - Y$

[b] Represent graphically the function $f : f(x) = x^2 - 4$, $x \in [-3, 3]$, from the graph deduce the vertex of the curve , the minimum value of the function.

3 If $X = \{1, 3, 4, 5\}$, $Y = \{1, 2, 3, 4, 5, 6\}$ and R is a relation from X to Y where "a R b" means "a + b = 7" for all $a \in X$, $b \in Y$, write R , and represent it by an arrow diagram and also by a Cartesian diagram. Is R a function ? and why ?

4 **[a]** If $y \propto x$, $y = 6$ when $x = 3$, find the value of y when $x = 5$

[b] Find the positive number which if we add its square to each of the two terms of the ratio 5 : 11 it becomes 3 : 5

5 **[a]** If a , b , c and d are in continued proportion , **then prove that :** $\frac{c^2 - d^2}{a - c} = \frac{b\,d}{a}$

[b] The following frequency distribution shows the ages of 10 children :

Ages in years	5	8	9	10	12	Total
Number of children	1	2	3	3	1	10

Calculate the standard deviation to the ages in years.

24 North Sinai Governorate



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from those given :**

1 $\sqrt{16} + \sqrt[3]{-8} =$ ....

(a) -4 (b) -2 (c) 2 (d) 4

2 If $(9, 4) \in \{9, 7\} \times \{x, 5\}$, then $x =$ ....

(a) 9 (b) 4 (c) 7 (d) 5

3 If $x^2 - y^2 = 12$, $x + y = 4$, then $x - y =$ ....

(a) -3 (b) 3 (c) 4 (d) 12

4 The fourth proportional of the quantities 2 , 3 , 6 equals ....

(a) 9 (b) 3 (c) 12 (d) 18

5 If $\frac{3}{4} + \frac{3}{x} = \frac{3}{2}$, then $x =$ ....

(a) 2 (b) 3 (c) $\frac{3}{2}$ (d) 4

6 The range of the set of the values 3 , 5 , 6 , 7 , 9 equals ....

(a) 3 (b) 4 (c) 6 (d) 12

---

2 [a] If X = {2 , 3 , 4} , Y = {2 , 3 , 4 , 5 , 6 , 7 , 8} and R is a relation from X to Y where "a R b" means "a = $\frac{1}{2}$ b" for all a ∈ X , b ∈ Y

1 Write R and represent it by an arrow diagram.

2 Show that R is a function from X to Y and find its range.

[b] If $y \propto x$ and y = 2 when $x = 8$, find the value of y when $x = 12$

---

3 [a] If $f(x) = 4x + b$, $f(3) = 15$, **find :** the value of b

[b] If $\frac{x}{y} = \frac{2}{3}$, **then find the value of :** $\frac{3x + 2y}{6y - x}$

---

4 [a] If (6 , b − 3) = (2 − a , − 1) , **find :** the value of a + b

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

---

5 [a] **Calculate the arithmetic mean and the standard deviation of the set of the values :** 23 , 12 , 17 , 13 , 15

[b] Graph the function $f : f(x) = 4 - x^2$ where $x \in [-3 , 3]$ **and from the graph find :**

1 The vertex of the curve.

2 The equation of the axis of symmetry.

3 The maximum value of the function.

25 Red Sea Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer from those given :**

1 The range of the set of the values 7 , 3 , 6 , 9 , 5 equals ....

(a) 3 (b) 4 (c) 6 (d) 12

2 If $x = 3$, y = 5 , then $y^x =$ ....

(a) 243 (b) 125 (c) 15 (d) 8

3 The relation which represents the direct variation between the two variables x and y is ....

(a) $x y = 5$ (b) $y = x + 3$ (c) $\frac{x}{3} = \frac{4}{y}$ (d) $\frac{x}{5} = \frac{y}{2}$

4 If $x - y = 5$, $x + y = 1$, then $x^2 - y^2 =$ ....

(a) 5 (b) 4 (c) 25 (d) $\frac{1}{25}$

5 If $n(X^2) = 9$, then $n(X) =$ ....

(a) 1 (b) 3 (c) 6 (d) 9

6 $[3 , 5] -]3 , 5] =$ ....

(a) $[3 , 5[$ (b) $\{3 , 5\}$ (c) $\{3\}$ (d) $\{5\}$

---

2 [a] If $X \times Y = \{(2 , 2) , (2 , 5) , (2 , 7)\}$, **find :**

1 Y 2 X^2

[b] If 5 a = 3 b , **find the value of :** $\frac{7a + 9b}{4a + 2b}$

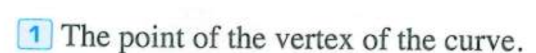
---

3 [a] If $y \propto \frac{1}{x}$ and y = 3 when $x = 2$, **then find :**

1 The relation between x and y 2 The value of y when $x = 1.5$

[b] The opposite figure represents the function $f : f(x) = x^2 - 2$

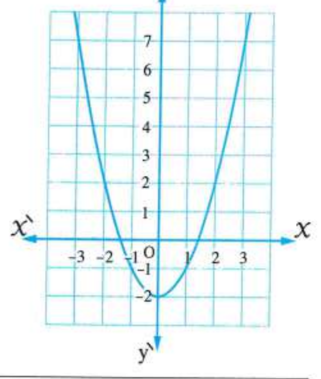
Find :



1 The point of the vertex of the curve.

2 The equation of the line of symmetry.

3 The maximum or minimum value of the function.



---

4 [a] If $X = \{-2 , -1 , 0 , 1 , 2\}$, R is a relation on X where "a R b" means "a is the additive inverse of b" for each $a \in X$, $b \in X$, write R and represent it by an arrow diagram.

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a - b}{a - c} = \frac{b}{b + c}$

---

5 [a] Represent graphically $f : f(x) = x - 3$, then find the points of intersection with x-axis and y-axis.

[b] **Calculate the standard deviation for the values :** 8 , 9 , 7 , 6 , 5

Answers of model examinations of the school book of algebra & statistics

Model 1




1

1 b 2 c 3 b 4 a 5 c 6 b

2

[a] 1 $Y = \{2, 5, 7\}$

2 $Y \times X = \{(2, 2), (5, 2), (7, 2)\}$

[b] Let $\frac{a}{b} = \frac{c}{d} = m$, where $m > 0$

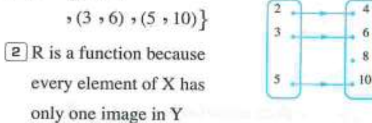
$\therefore a = b\,m$, $c = d\,m$

$\therefore$ L.H.S. $= \frac{a}{b-a} = \frac{b\,m}{b - b\,m} = \frac{b\,m}{b\,(1-m)} = \frac{m}{1-m}$ (1)

, R.H.S. $= \frac{c}{d-c} = \frac{d\,m}{d - d\,m} = \frac{d\,m}{d\,(1-m)} = \frac{m}{1-m}$ (2)

From (1) , (2) : $\therefore \frac{a}{b-a} = \frac{c}{d-c}$

3



[a] 1 $R = \{(2, 4), (3, 6), (5, 10)\}$

2 R is a function because every element of X has only one image in Y

[b] Let the number be x

$\therefore \frac{x+7}{x+11} = \frac{2}{3}$

$\therefore 3x + 21 = 2x + 22$ $\therefore x = 1$

$\therefore$ The required number is 1

4

[a] 1 The range $= \{3, 1, 5\}$

2 $a + b = 8$

[b] 1 $\because y \propto \frac{1}{x}$ $\therefore x\,y = m$

$\therefore m = 2 \times 3 = 6$ $\therefore x\,y = 6$

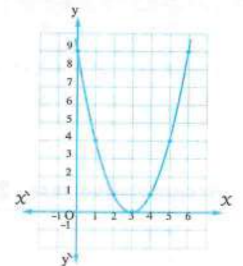
2 At $x = 1.5$ $\therefore y = \frac{6}{1.5} = 4$

5

[a] $f(x) = (x-3)^2$



x	0	1	2	3	4	5	6
$f(x)$	9	4	1	0	1	4	9



From the graph :

The vertex of the curve is (3 , 0)

, the minimum value = 0

, the equation of the axis of symmetry is : $x = 3$

[b] Form the table by yourself

, then the arithmetic mean = 7

, the standard deviation $\simeq 1.41$

Model 2

1

1 a 2 c 3 d 4 b 5 c 6 a

2

[a] 1 $n(X \times Z) = 2$

2 $(Y \cap X) \times Z = \{2\} \times \{3\} = \{(2, 3)\}$

[b] $\because$ b is the middle proportional between a and c

$\therefore \frac{a}{b} = \frac{b}{c} = m$ $\therefore b = c\,m$, $a = c\,m^2$

$\therefore$ L.H.S. $= \frac{a-b}{a-c} = \frac{c\,m^2 - c\,m}{c\,m^2 - c} = \frac{c\,m\,(m-1)}{c\,(m^2-1)}$

$= \frac{c\,m\,(m-1)}{c\,(m-1)\,(m+1)} = \frac{m}{m+1}$ (1)

, R.H.S. $= \frac{b}{b+c} = \frac{c\,m}{c\,m + c} = \frac{c\,m}{c\,(m+1)} = \frac{m}{m+1}$ (2)

From (1) , (2) : $\therefore \frac{a-b}{a-c} = \frac{b}{b+c}$

3

[a] 1 $R = \{(1 , 6) , (3 , 4) , (4 , 3) , (5 , 2)\}$

2 R is a function because every element of X has only one image in Y

[b] $\because 5a = 3b \qquad \therefore \frac{a}{b} = \frac{3}{5}$

$\therefore a = 3m , b = 5m$

$\therefore \frac{7a + 9b}{4a + 2b} = \frac{7 \times 3m + 9 \times 5m}{4 \times 3m + 2 \times 5m} = \frac{66m}{22m} = 3$

4

[a] $\because f(x) = 4x + b , f(3) = 15$

$\therefore 4 \times 3 + b = 15 \qquad \therefore b = 3$

[b] 1 $\because y \propto x \qquad \therefore y = mx$

$\therefore 6 = m \times 3 \qquad \therefore m = 2$

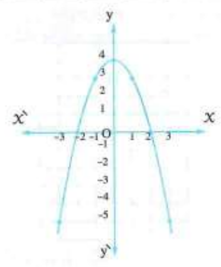
$\therefore y = 2x$

2 At $x = 5 \qquad \therefore y = 2 \times 5 = 10$

5

[a] $f(x) = 4 - x^2$

x	−3	−2	−1	0	1	2	3
$f(x)$	−5	0	3	4	3	0	−5



From the graph : The vertex of the curve is (0 , 4)

, the maximum value = 4

, the equation of the axis of symmetry is : $x = 0$

[b] Form the tables by yourself

, then the mean = 2.26

, the standard deviation ≃ 1.06

Answers of model for the merge students

1

1 the first 2 the third 3 30

4 x 5 9 6 9

2

1 a 2 a 3 d

4 b 5 c 6 c

3

1 ✔ 2 ✘ 3 ✘

4 ✔ 5 ✔ 6 ✔

4

1 1 2 6 3 8

4 10 5 ± 6 6 2

Answers of governorates' examinations of algebra & statistics

1 Cairo

1

1 a 2 a 3 c 4 d 5 b 6 c

2

[a] 1 $X \times Y = \{(2 , 3) , (2 , 4) , (2 , 5)\}$

2 $n(Y^2) = 9$

3 $X^2 = \{(2 , 2)\}$

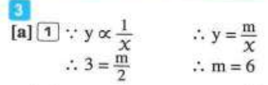
[b] $\because \frac{a}{b} = \frac{3}{5}$ $\therefore a = 3m , b = 5m.$

$\therefore \frac{7a + 9b}{4a + 2b} = \frac{7 \times 3m + 9 \times 5m}{4 \times 3m + 2 \times 5m} = \frac{66m}{22m} = 3$

3

[a] 1 $\because y \propto \frac{1}{x}$ $\therefore y = \frac{m}{x}$

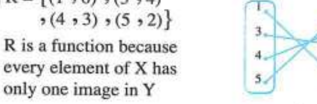
$\therefore 3 = \frac{m}{2}$ $\therefore m = 6$ $\therefore y = \frac{6}{x}$



2 at $x = 1.5$ $\therefore y = \frac{6}{1.5} = 4$

[b] $R = \{(1 , 6) , (3 , 4) , (4 , 3) , (5 , 2)\}$

R is a function because every element of X has only one image in Y



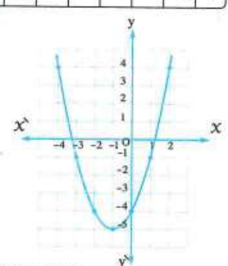


4

[a] Form the tables by yourself , then $\sigma \simeq 1.73$

[b] $f(x) = x^2 + 2x - 4$

x	−4	−3	−2	−1	0	1	2
$f(x)$	4	−1	−4	−5	−4	−1	4



From the graph :

1 The vertex of the curve is : $(-1 , -5)$

2 The equation of the axis of symmetry is $x = -1$

5

[a] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore L.H.S. = \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + ac}{ac + c^2} = \frac{a(a + c)}{c(a + c)} = \frac{a}{c} = R.H.S.$

[b] 1 $\because f(2) = 2^2 - 2 \times 2 = 4 - 4 = 0$

$, g(2) = 2 - 2 = 0$

$\therefore f(2) = g(2)$

2 $\because g(k) = 7$

$\therefore k - 2 = 7$ $\therefore k = 9$

2 Giza

1

1 a 2 c 3 b 4 b 5 b 6 a

2

[a] $\because (x + 3 , 9) = (5 , y^2)$

$\therefore x + 3 = 5$ $\therefore x = 2$

$, y^2 = 9$ $\therefore y = \pm 3$

[b] 1 $\because y \propto \frac{1}{x}$ $\therefore y = \frac{m}{x}$

$\therefore 4 = \frac{m}{2}$ $\therefore m = 8$ $\therefore y = \frac{8}{x}$

2 at $x = 8$

$\therefore y = \frac{8}{8} = 1$

3

[a] 1 $R = \{(0 , 0) , (2 , 1) , (4 , 2) , (6 , 3)\}$

R is not a function because the elements 1 , 3 and 5 $\in$ X have no images in X

2 No

3 $\because 6 R x$ $\therefore x = 3$

[b] $\because \frac{a}{b} = \frac{b}{c} = m$ $\therefore b = cm$, $a = cm^2$

$\therefore \frac{a - b}{a - c} = \frac{cm^2 - cm}{cm^2 - c} = \frac{cm(m - 1)}{c(m^2 - 1)}$

$= \frac{cm(m - 1)}{c(m - 1)(m + 1)} = \frac{m}{m + 1}$ (1)

$, \frac{b}{b + c} = \frac{cm}{cm + c} = \frac{cm}{c(m + 1)} = \frac{m}{m + 1}$ (2)

From (1) , (2) : $\therefore \frac{a - b}{a - c} = \frac{b}{b + c}$

4

[a] $\because$ AO = 4 units. $\therefore$ A (0 , 4)

$\because$ A (0 , 4) belongs to the curve of the function f

$\therefore$ A satisfies the equation of the curve

$\therefore 4 = m - (0)^2$ $\therefore m = 4$

$\because$ The curve of the function intersects X-axis at the two points B and C

$\therefore 0 = 4 - X^2$ $\therefore X^2 = 4$

$\therefore X = 2$ or -2

$\therefore$ B = (2 , 0) , C = (−2 , 0)

$\therefore$ BC = 4 units.

The area of Δ ABC $= \frac{1}{2} \times 4 \times 4 = 8$ square units

[b] 1 $\because f(3) = 9$ $\therefore 2 \times 3 + a = 9$ $\therefore a = 3$

2 At $f(X) = 0$ $\therefore 2X + 3 = 0$

$\therefore 2X = -3$ $\therefore X = \frac{-3}{2}$

$\therefore$ The intersection point with X-axis is $\left(\frac{-3}{2} , 0\right)$

5

[a] $\because \frac{X}{2} = \frac{y}{3} = \frac{z}{4} = \frac{2X - y + 5z}{3m}$

, multiplying the two terms of the 1st ratio by 2 and the 2nd by − 1 and the 3rd by 5 and adding the antecedents and consequents of the three ratios.

$\therefore \frac{2X - y + 5z}{4 - 3 + 20}$ = one of the given ratios.

$\therefore \frac{2X - y + 5z}{21} = \frac{2X - y + 5z}{3m}$

$\therefore 3m = 21$ $\therefore m = 7$

[b] Form the table by yourself , then $\sigma \simeq 2.83$

3 Alexandria

1

1 c 2 a 3 b 4 d 5 d 6 b

2

[a] 1 n (X × Z) = 2

2 $Y \cap X = \{2\}$

$, (Y \cap X) \times Z = \{2\} \times \{3\} = \{(2 , 3)\}$

[b] Let the number be X

$\therefore \frac{5 + X^2}{11 + X^2} = \frac{3}{5}$ $\therefore 25 + 5X^2 = 33 + 3X^2$

$\therefore 2X^2 = 8$ $\therefore X^2 = 4$

$\therefore X = 2$ or $X = -2$ $\therefore$ The number is : 2 or − 2

3

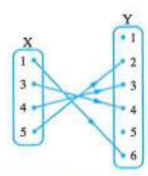
[a] $\frac{X}{3} = \frac{y}{4} = \frac{z}{5} = m$

$\therefore X = 3m , y = 4m , z = 5m$

$\therefore \frac{2y - z}{3X - 2y + z} = \frac{8m - 5m}{9m - 8m + 5m} = \frac{3m}{6m} = \frac{1}{2}$

[b] R = {(1 , 6) , (3 , 4) , (4 , 3) , (5 , 2)}

R is a function because every element in X has only one image in Y



4

[a] 1 $\because y \propto \frac{1}{X}$ $\therefore Xy = m$

$\therefore 4 \times 2 = m$ $\therefore m = 8$ $\therefore Xy = 8$

2 at $X = 16$

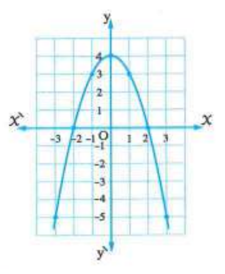
$16y = 8$ $\therefore y = \frac{1}{2}$

[b] Form the tables by yourself , then $\sigma \simeq 4.24$

5

[a] $f(X) = 4 - X^2$

X	−3	−2	−1	0	1	2	3
$f(X)$	−5	0	3	4	3	0	−5



From the graph :

1 The vertex of the curve is : (0 , 4)

2 The maximum value = 4

3 The equation of the line of symmetry is : $X = 0$

[b] $f(1) + r(3) = -7$

$\therefore 5 - a + 3 - 2a = -7$

$\therefore -3a = -15$ $\therefore a = 5$

4 El-Kalyoubia

1

1 c 2 d 3 a 4 b 5 d 6 c

2

[a] 1 $\because y \propto \frac{1}{x}$ $\therefore xy = m$

$\therefore 2 \times 3 = m$ $\therefore m = 6$ $\therefore xy = 6$

2 at $x = \frac{3}{2}$

$\therefore \frac{3}{2} y = 6$ $\therefore y = 4$

[b] $\because \frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3x}$

, multiplying the two terms of the 1^{st} ratio by 2 and the 2^{nd} by -1 and the 3^{rd} by 5 and adding the antecedents and consequents of the three ratios.

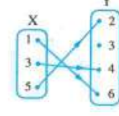
$\therefore \frac{2a - b + 5c}{4 - 3 + 20}$ = one of the given ratios.

$\therefore \frac{2a - b + 5c}{21} = \frac{2a - b + 5c}{3x}$

$\therefore 3x = 21$ $\therefore x = 7$

3

[a] 1 $R = \{(1, 6), (3, 4), (5, 2)\}$



2 R is a function because every element in X has only one image in Y

[b] $\because \frac{a}{b} = \frac{b}{c} = m$ $\therefore b = cm$, $a = cm^2$

$\therefore \frac{a - c}{a - b} = \frac{cm^2 - c}{cm^2 - cm} = \frac{c(m^2 - 1)}{cm(m - 1)}$

$= \frac{(m-1)(m+1)}{m(m-1)} = \frac{m+1}{m}$ (1)

, $\frac{b + c}{b} = \frac{cm + c}{cm} = \frac{c(m+1)}{cm} = \frac{m+1}{m}$ (2)

From (1), (2) : $\therefore \frac{a - c}{a - b} = \frac{b + c}{b}$

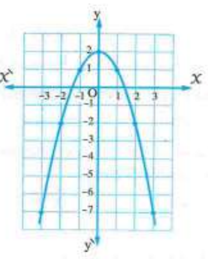
4

[a] 1 $X = \{1\}$, $Y = \{1, 3, 5\}$

2 $Y \times X = \{(1, 1), (3, 1), (5, 1)\}$

[b] $f(x) = 2 - x^2$

x	-3	-2	-1	0	1	2	3
$f(x)$	-7	-2	1	2	1	-2	-7



From the graph :

1 The vertex of the curve is : (0 , 2)

2 The maximum value = 2

3 The equation of the line of symmetry is : $x = 0$

5

[a] 1 The range = $\{3, 1, 5\}$

2 $\because$ R is a function on X

$\therefore$ Each element in X appears only once as a first projection in R

$\therefore a = 3, b = 5$ or $a = 5, b = 3$

$\therefore a + b = 3 + 5 = 8$

[b] Form the tables by yourself

, then the mean $(\overline{x}) = 6$, $\sigma \simeq 2.32$

5 El-Monofia

1

1 b 2 d 3 c 4 c 5 d 6 d

2

[a] 1 $\because Y \cap Z = \{5\}$

$\therefore X \times (Y \cap Z) = \{4, 3\} \times \{5\}$

$= \{(4, 5), (3, 5)\}$

2 $\because X - Y = \{3\}$

$\therefore (X - Y) \times Z = \{3\} \times \{5, 6\}$

$= \{(3, 5), (3, 6)\}$

3 $n(Z^2) = 4$

[b] $\because \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = m$

$\therefore c = dm$, $b = dm^2$, $a = dm^3$

$\therefore \frac{a\,b - c\,d}{b^2 - c^2} = \frac{d^2\,m^5 - d^2\,m}{d^2\,m^4 - d^2\,m^2} = \frac{d^2\,m\,(m^4 - 1)}{d^2\,m^2\,(m^2 - 1)}$

$= \frac{d^2\,m\,(m^2 - 1)\,(m^2 + 1)}{d^2\,m^2\,(m^2 - 1)}$

$= \frac{m^2 + 1}{m}$ (1)

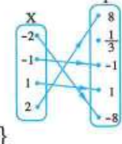
$\therefore \frac{a + c}{b} = \frac{d\,m^3 + d\,m}{d\,m^2} = \frac{d\,m\,(m^2 + 1)}{d\,m^2} = \frac{m^2 + 1}{m}$ (2)

From (1) , (2) : $\therefore \frac{a\,b - c\,d}{b^2 - c^2} = \frac{a + c}{b}$



3

[a] 1 $R = \{(-2 , -8) , (-1 , -1) , (1 , 1) , (2 , 8)\}$



2 R is a function because every element of X has only one image in Y

, its range $= \{-8 , -1 , 1 , 8\}$

[b] $\because$ (0 , 3) satisfies the function

$\therefore 3 = a \times 0 + b$ $\therefore b = 3$

$, \because f(2) = 7$ $\therefore 7 = 2\,a + 3$

$\therefore 2\,a = 4$ $\therefore a = 2$

4

[a] Let the number be x

$\therefore \frac{x^2 + 7}{x^2 + 11} = \frac{4}{5}$ $\therefore 5\,x^2 + 35 = 4\,x^2 + 44$

$\therefore x^2 - 9 = 0$ $\therefore (x + 3)\,(x - 3) = 0$

$\therefore x = -3$ or $x = 3$

$\therefore$ The number is : -3 or 3

[b] 1 $\because y \propto \frac{1}{x^2}$ $\therefore x^2\,y = m$

$\therefore 3^2 \times 4 = m$ $\therefore m = 36$ $\therefore x^2\,y = 36$

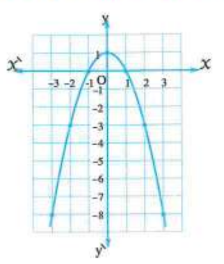
2 at $y = 9$

$\therefore x^2 \times 9 = 36$ $\therefore x^2 = 4$ $\therefore x = \pm 2$

5

[a] $f(x) = 1 - x^2$

x	-3	-2	-1	0	1	2	3
$f(x)$	-8	-3	0	1	0	-3	-8



From the graph :

1 The vertex of the curve is (0 , 1)

2 The equation of the axis of symmetry is $x = 0$

3 The area $= \frac{1}{2} \times 2 \times 1 = 1$ square unit.

[b] Form the tables by yourself , then the mean $(\overline{x}) = 2$, $\sigma \simeq 0.96$

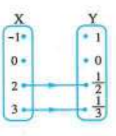
6 El-Gharbia

1

1 c 2 c 3 c 4 a 5 c 6 c

2

[a] $R = \left\{\left(2 , \frac{1}{2}\right) , \left(3 , \frac{1}{3}\right)\right\}$



R is not a function because the elements $-1 \in X$, $0 \in X$ have no images in Y

[b] 1 inverse variation

2 $\because y \propto \frac{1}{x}$ $\therefore x\,y = m$ $\therefore m = 12$

3 at $x = 3$ $\therefore 3\,y = 12$ $\therefore y = 4$

3

[a] $\because \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = m$

$\therefore c = d\,m$, $b = d\,m^2$, $a = d\,m^3$

$\therefore \frac{a}{b + d} = \frac{d\,m^3}{d\,m^2 + d} = \frac{d\,m^3}{d\,(m^2 + 1)} = \frac{m^3}{m^2 + 1}$ (1)

$, \frac{c^3}{c^2\,d + d^3} = \frac{d^3\,m^3}{d^3\,m^2 + d^3} = \frac{d^3\,m^3}{d^3\,(m^2 + 1)} = \frac{m^3}{m^2 + 1}$ (2)

From (1) , (2) : $\therefore \frac{a}{b + d} = \frac{c^3}{c^2\,d + d^3}$

[b] 1 $n(X^2) = 1$

2 $Z - Y = \{5, 6\}$, $X \cap Z = \{6\}$

$, (Z - Y) \times (X \cap Z) = \{5, 6\} \times \{6\}$

$= \{(5, 6), (6, 6)\}$

4

[a] Let the two numbers be : $2X, 3X$

$\therefore \frac{2X + 7}{3X - 12} = \frac{5}{3}$

$\therefore 15X - 60 = 6X + 21$

$\therefore 9X = 81$ $\therefore X = 9$

$\therefore$ The two numbers are : 18 , 27

[b] $\because$ The straight line passes through (a , 2 a)

$\therefore 3a - 6 = 2a$ $\therefore a = 6$

at $X = 0$

$\because f(0) = 3 \times 0 - 6 = -6$

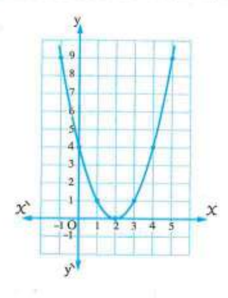
$\therefore$ The straight line intersects the y-axis at (0 , − 6)

5

[a] Form the table by yourself , then $\sigma \simeq 9.3$

[b] $f(X) = (X - 2)^2$

X	−1	0	1	2	3	4	5
$f(X)$	9	4	1	0	1	4	9



From the graph :

1 The equation of the axis of symmetry is : $X = 2$

2 The minimum value = 0

7 El-Dakahlia

1

[a] 1 a 2 d 3 d

[b] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore \text{L.H.S.} = \frac{2c^2 - 3b^2}{2b^2 - 3a^2} = \frac{2c^2 - 3ac}{2ac - 3a^2} = \frac{c(2c - 3a)}{a(2c - 3a)}$

$= \frac{c}{a} = \text{R.H.S.}$

2

[a] 1 c 2 a 3 b

[b] $\because$ (− 1 , 2) is the vertex of the curve

$\therefore -1 = \frac{-b}{2a}$ $\therefore \frac{6}{2a} = -1$

$\therefore -2a = 6$ $\therefore a = -3$

$, \because (-1, 2) \in$ the curve of the function

$\therefore 2 = -3 + 6 + c$ $\therefore c = -1$

3

[a] $\because 3a = 4b = 6c$

$\therefore a = \frac{4}{3}b$, $c = \frac{2}{3}b$

$\therefore a : b : c = \frac{4}{3}b : b : \frac{2}{3}b$ (multiplying by 3)

$\therefore a : b : c = 4b : 3b : 2b$ (dividing by b)

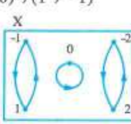
$\therefore a : b : c = 4 : 3 : 2$

$\therefore a = 4m$, $b = 3m$, $c = 2m$

$\therefore \frac{3a + 2b}{a + 4c} = \frac{12m + 6m}{4m + 8m} = \frac{18m}{12m} = \frac{3}{2}$

[b] $R = \{(-2, 2), (-1, 1), (0, 0), (1, -1), (2, -2)\}$

R is a function because every element of X has only one image in X



4

[a] $\because z \propto \frac{1}{y}$ $\therefore z = \frac{m}{y}$

$\therefore 2 = \frac{m}{3}$ $\therefore m = 6$

$\therefore z = \frac{6}{y}$ $\therefore X = \frac{6}{y} + 8$

, at $X = 3$

$\therefore 3 = \frac{6}{y} + 8$ $\therefore -5 = \frac{6}{y}$

$\therefore -5y = 6$ $\therefore y = \frac{6}{-5}$

[b] $\because d(2) = 2 \times 2 + 5 = 9$

$, 3\,r(3) = 3(3-6) = -9$

$\therefore d(2) + 3\,r(3) = 9 + (-9) = 0$

5

[a] Form the table by yourself , then $\overline{X} = 7$, $\sigma \simeq 1.41$

[b] $\because (X-2 , 3^{y-1}) = (3 , 1)$

$\therefore X - 2 = 3 \quad \therefore X = 5$

$, 3^{y-1} = 1 \quad \therefore 3^{y-1} = 3^0$

$\therefore y - 1 = 0 \quad \therefore y = 1$

8 Ismailia

1



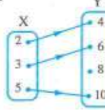
1 a 2 c 3 b 4 a 5 d 6 a

2

[a] 1 $R = \{(2 , 4) , (3 , 6) , (5 , 10)\}$

2 R is a function because every element in X has only one image in Y

, the range $= \{4 , 6 , 10\}$



[b] Let the two numbers be : 3 m , 7 m

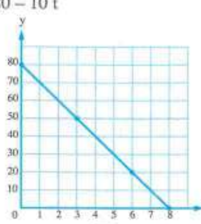
$\therefore \frac{3m-5}{7m-5} = \frac{1}{3} \qquad \therefore 9m - 15 = 7m - 5$

$\therefore 2m = 10 \qquad \therefore m = 5$

$\therefore$ The two numbers are : 15 , 35

3

[a] 1 $y = 80 - 10t$



2 8 hours 3 80 pages

[b] $\because \frac{X}{y} = \frac{z}{\ell} = m \qquad \therefore X = y\,m , z = \ell\,m$

$\therefore \frac{y-X}{X} = \frac{y-y\,m}{y\,m} = \frac{y(1-m)}{y\,m} = \frac{1-m}{m}$ (1)

$, \frac{\ell - z}{z} = \frac{\ell - \ell\,m}{\ell\,m} = \frac{\ell(1-m)}{\ell\,m} = \frac{1-m}{m}$ (2)

From (1) , (2) : $\therefore \frac{y-X}{X} = \frac{\ell - z}{z}$

4

[a] $\because y \propto X \qquad \therefore y = m\,X \qquad \therefore 40 = 14\,m$

$\therefore m = \frac{20}{7} \qquad \therefore y = \frac{20}{7} X$

at $y = 80 \qquad \therefore 80 = \frac{20}{7} X \qquad \therefore X = 28$

[b] 1 $\because X = \{1 , 2\} , Y = \{2 , 3\}$

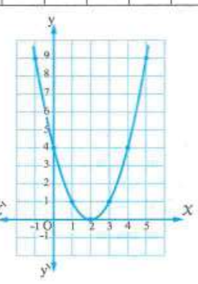
$\therefore X \cup Y = \{1 , 2 , 3\}$

2 $n(Y^2) = 4$

5

[a] $f(X) = (X-2)^2$

X	−1	0	1	2	3	4	5
$f(X)$	9	4	1	0	1	4	9



From the graph :

1 The vertex of the curve is : (2 , 0)

2 The equation of the line of symmetry is : $X = 2$

3 The minimum value = 0

[b] Form the table by yourself , then $\sigma \simeq 3.29$



9 Suez

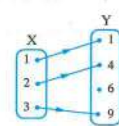
1

1 c 2 d 3 c 4 a 5 b 6 b

2

[a] 1 $R = \{(1 , 1) , (2 , 4) , (3 , 9)\}$

2



3 R is a function because every element in X has only one image in Y

[b] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore$ L.H.S. $= \frac{2c^2 - 3b^2}{2b^2 - 3a^2} = \frac{2c^2 - 3ac}{2ac - 3a^2} = \frac{c(2c - 3a)}{a(2c - 3a)}$

$= \frac{c}{a} =$ R.H.S.

3

[a] $\because (2x, 4) = (8, y + 1)$

$\therefore 2x = 8 \quad \therefore x = 4$

$, y + 1 = 4 \quad \therefore y = 3$

$\therefore \sqrt{x^2 + y^2} = \sqrt{4^2 + 3^2} = \sqrt{25} = 5$

[b] 1 $\because y \propto x \quad \therefore y = mx$

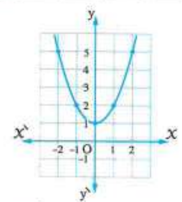
$\therefore 2 = 8m \quad \therefore m = \frac{1}{4} \quad \therefore y = \frac{1}{4}x$

2 at $x = 12 \quad \therefore y = \frac{1}{4} \times 12 \quad \therefore y = 3$

4

[a] $f(x) = x^2 + 1$

x	-2	-1	0	1	2
$f(x)$	5	2	1	2	5



From the graph :

1 The vertex of the curve is : (0 , 1)

2 The equation of the line of symmetry is : $x = 0$

3 The minimum value = 1

[b] $\because \frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3x}$

, multiplying the two terms of the 1st ratio by 2 and the 2nd by -1 and the 3rd by 5 and adding the antecedents and consequents of the three ratios.

$\therefore \frac{2a - b + 5c}{4 - 3 + 20} =$ one of the given ratios.

$\therefore \frac{2a - b + 5c}{21} = \frac{2a - b + 5c}{3x}$

$\therefore 3x = 21 \quad \therefore x = 7$

5

[a] 1 The range $= \{3, 1, 5\}$

2 $\because f$ is a function on X

$\therefore$ Each element in X appears only once as a first projection in R

$\therefore a = 3, b = 5$ or $a = 5, b = 3$

$\therefore a + b = 3 + 5 = 8$

[b] Form the table by yourself , then $\sigma \simeq 1.41$

10 Port Said

1

1 b 2 c 3 a 4 a 5 d 6 c

2

[a] $R = \{(2, 4), (3, 6), (4, 8)\}$

R is a function because every element of X has only one image in Y

, its range $= \{4, 6, 8\}$

[b] $\because f(3) = 15 \quad \therefore 4 \times 3 + b = 15$

$\therefore 12 + b = 15 \quad \therefore b = 3$

3

[a] 1 $f(\sqrt{2}) + 3g(\sqrt{2})$

$= (\sqrt{2})^2 - 3 \times \sqrt{2} + 3(\sqrt{2} - 3)$

$= 2 - 3\sqrt{2} + 3\sqrt{2} - 9 = -7$

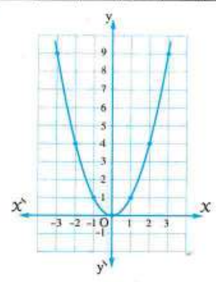
2 $\because f(3) = (3)^2 - 3 \times 3 = 9 - 9 = 0$

$, g(3) = 3 - 3 = 0$

$\therefore f(3) = g(3) = 0$

[b] $f(x) = x^2$

x	-3	-2	-1	0	1	2	3
$f(x)$	9	4	1	0	1	4	9



From the graph :

The vertex of the curve is : (0 , 0)

, the minimum value = 0

, the equation of the axis of symmetry is : $X = 0$

4

[a] $\because$ b is the middle proportional between a and b

$\therefore b^2 = ac$

$\therefore$ L.H.S. $= \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + ac}{ac + c^2} = \frac{a(a+c)}{c(a+c)} = \frac{a}{c} =$ R.H.S.

[b] 1 $\because y \propto X$ $\quad \therefore y = mX$

$\therefore 14 = 42\,m \quad \therefore m = \frac{1}{3} \quad \therefore y = \frac{1}{3}X$

2 at $X = 60$

$\therefore y = \frac{1}{3} \times 60 \quad \therefore y = 20$

5

[a] Form the table by yourself , then $\sigma \simeq 9.32$

[b] $\because h \propto \frac{1}{r^2} \quad \therefore \frac{h_1}{h_2} = \frac{r_2^2}{r_1^2}$

$\therefore \frac{27}{h_2} = \frac{(15.75)^2}{(10.5)^2}$

$\therefore h_2 = \frac{27 \times 110.25}{248.0625} = 12$ cm.

11 Damietta

1

1 a 2 c 3 a 4 d 5 d 6 c

2

[a] $X - Y = \{1 , 9\}$

$(X - Y) \times Z = \{1 , 9\} \times \{4\} = \{(1 , 4) , (9 , 4)\}$

[b] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore$ L.H.S. $= \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + ac}{ac + c^2} = \frac{a(a+c)}{c(a+c)} = \frac{a}{c} =$ R.H.S.

3

[a] 1 $\because y \propto \frac{1}{X} \quad \therefore y = \frac{m}{X} \quad \therefore 3 = \frac{m}{2}$

$\therefore m = 6 \quad \therefore y = \frac{6}{X}$

2 at $X = 1.5 \quad \therefore y = \frac{6}{1.5} = 4$

[b] 1 $\because \frac{y}{X - z} = \frac{X}{y} = \frac{X + y}{z}$

, adding the antecedents and consequents of the three ratios.

$\therefore \frac{y + X + X + y}{X - z + y + z} = \frac{2(X + y)}{(X + y)} = 2$

= one of the given ratios.

$\therefore$ Each ratio = 2 unless $X + y = 0$

2 $\because \frac{X}{y} = 2 \quad \therefore X = 2y$

$\therefore \frac{X + y}{z} = 2 \quad \therefore X + y = 2z$

$\therefore 2y + y = 2z \quad \therefore 3y = 2z$

4

[a] $\because (X^3 , y + 1) = (8 , 3)$

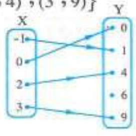
$\therefore X^3 = 8 \quad \therefore X = \sqrt[3]{8} = 2$

$, y + 1 = 3 \quad \therefore y = 2$

$\therefore \sqrt[3]{X + 3y} = \sqrt[3]{2 + 3 \times 2} = \sqrt[3]{8} = 2$

[b] 1 $R = \{(-1 , 1) , (0 , 0) , (2 , 4) , (3 , 9)\}$

2 R is a function because every element of X has only one image in Y , its range = $\{0 , 1 , 4 , 9\}$



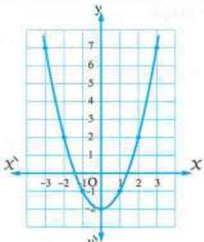
5

[a] Form the table by yourself

, then the mean $(\overline{X}) = 63$, $\sigma \simeq 7.07$

[b] $f(X) = X^2 - 2$

X	−3	−2	−1	0	1	2	3
$f(X)$	7	2	−1	−2	−1	2	7



From the graph :

1 The vertex of the curve is : (0 , −2)

2 The equation of the axis of symmetry is : $X = 0$

12 Kafr El-Sheikh

1

1 b 2 a 3 a 4 c 5 a 6 c

2

[a] $R = \{(-1, 2), (1, 6), (2, 8)\}$

R is a function because every element in X has only one image in Y

, the range $= \{2, 6, 8\}$

[b] $\because \frac{21x - y}{7x - z} = \frac{y}{z}$

$\therefore 7xy - zy = 21xz - zy$

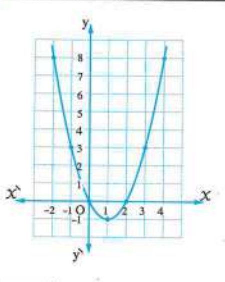
$\therefore 7xy = 21xz$

$\therefore y = \frac{21xz}{7x} = 3z \qquad \therefore y \propto z$

3

[a] $f(x) = x^2 - 2x$

x	-2	-1	0	1	2	3	4
$f(x)$	8	3	0	-1	0	3	8



From the graph :

1 The equation of the line of symmetry is : $x = 1$

2 The minimum value $= -1$

[b] $\because \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = m$

$\therefore c = dm \quad , \quad b = dm^2 \quad , \quad a = dm^3$

$\therefore \frac{a}{b+d} = \frac{dm^3}{dm^2+d} = \frac{dm^3}{d(m^2+1)} = \frac{m^3}{m^2+1} \qquad (1)$

$\therefore \frac{c^3}{c^2d+d^3} = \frac{d^3m^3}{d^3m^2+d^3} = \frac{d^3m^3}{d^3(m^2+1)} = \frac{m^3}{m^2+1} \qquad (2)$

From (1) , (2) : $\therefore \frac{a}{b+d} = \frac{c^3}{c^2d+d^3}$

4

[a] $\because \frac{x+y}{3} = \frac{y+z}{8} = \frac{z+x}{6}$

, adding the antecedents and consequents of the three ratios.

$\therefore \frac{x+y+y+z+z+x}{3+8+6} = \frac{2x+2y+2z}{17}$

$= \frac{2(x+y+z)}{17}$ = one of the given ratios. (1)

, multiplying the terms of 2nd ratio by 2 and adding the antecedents and consquents of the three ratios.

$\therefore \frac{x+y+2y+2z+z+x}{3+16+6} = \frac{2x+3y+3z}{25}$

= one of the given ratios. (2)

From (1) and (2) : $\therefore \frac{2(x+y+z)}{17} = \frac{2x+3y+3z}{25}$

$\therefore \frac{x+y+z}{2x+3y+3z} = \frac{17}{50}$

[b] $\because$ (a , 4) satisfies the function.

$\therefore 2a + b = 4$ (multiplying by 3)

$\therefore 6a + 3b = 12$

5

[a] Form the tables by yourself

, then the mean $(\overline{x}) = 40.75$, $\sigma \simeq 13.4$

[b] $\because$ The straight line intersects from the positive part of y-axis a part of length 3 units

$\therefore b = 3$

, $\because$ the straight line passes through (1 , 5)

$\therefore a + 3 = 5 \qquad \therefore a = 2$

13 El-Beheira

1

1 b   2 d   3 b   4 d   5 a   6 c

2

[a] 1 $R = \{(2, 4), (3, 6), (5, 10)\}$

2 R is a function because every element of X has only one image in Y

[b] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore$ L.H.S. $= \frac{2c^2 - 3b^2}{2b^2 - 3a^2} = \frac{2c^2 - 3ac}{2ac - 3a^2} = \frac{c(2c-3a)}{a(2c-3a)}$

$= \frac{c}{a}$ = R.H.S.

3

[a] 1 $\because y \propto \frac{1}{x} \qquad \therefore y = \frac{m}{x} \qquad \therefore 9 = \frac{m}{2}$

$\therefore m = 18 \qquad \therefore y = \frac{18}{x}$

2 at $x = 3 \qquad \therefore y = \frac{18}{3} \qquad \therefore y = 6$

[b] $\because f(2) = 12 \qquad \therefore 12 = 5 \times 2 + a$

$\therefore 10 + a = 12 \qquad \therefore a = 2$

4

[a] 1 $X - Y = \{3\}$

$\therefore (X - Y) \times Z = \{3\} \times \{6, 5\}$

$= \{(3, 6), (3, 5)\}$

2 $n(X \times Y) = 4$

[b] Let the number be x

$\therefore \frac{49 - 3x}{69 - 3x} = \frac{2}{3}$ $\quad \therefore 147 - 9x = 138 - 6x$

$\therefore 3x = 9$ $\quad \therefore x = 3$

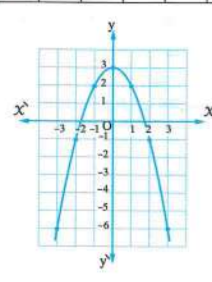
5

[a] Form the table by yourself

, then the mean $(\overline{X}) = 16$, $\sigma \simeq 4.43$

[b] $f(x) = 3 - x^2$

x	-3	-2	-1	0	1	2	3
$f(x)$	-6	-1	2	3	2	-1	-6



From the graph :

1 The equation of the axis of symmetry is : $x = 0$

2 The maximum value = 3

14 El-Fayoum

1

1 b   2 b   3 d   4 a   5 b   6 a

2

[a] 1 $n(X \times Y) = 4$

2 $Y \cap X = \{2\}$

$, (Y \cap X) \times Z = \{2\} \times \{3\} = \{(2, 3)\}$

[b] $\because a = 2b$

$\therefore \frac{8a + 5b}{7a - 2b} = \frac{16b + 5b}{14b - 2b} = \frac{21b}{12b} = \frac{7}{4}$

3

[a] 1 $R = \{(1, 1), (2, \frac{1}{2}), (3, \frac{1}{3})\}$

2 Yes , its range $= \{1, \frac{1}{2}, \frac{1}{3}\}$

[b] $\because f\left(\frac{1}{4}\right) = 12$ $\quad \therefore 12 = 4 \times \frac{1}{4} + a$

$\therefore 1 + a = 12$ $\quad \therefore a = 11$

4

[a] $\because \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = m$

$\therefore c = dm$, $b = dm^2$, $a = dm^3$

$\therefore \frac{a}{b + d} = \frac{dm^3}{dm^2 + d} = \frac{dm^3}{d(m^2 + 1)} = \frac{m^3}{m^2 + 1}$ (1)

$\therefore \frac{c^3}{c^2 d + d^3} = \frac{d^3 m^3}{d^3 m^2 + d^3} = \frac{d^3 m^3}{d^3(m^2 + 1)} = \frac{m^3}{m^2 + 1}$ (2)

From (1) , (2) : $\therefore \frac{a}{b + d} = \frac{c^3}{c^2 d + d^3}$

[b] 1 $\because y \propto \frac{1}{x}$ $\quad \therefore y = \frac{m}{x}$

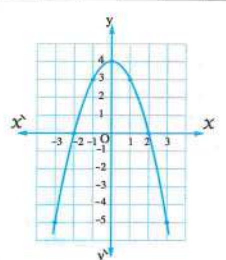
$\therefore 3 = \frac{m}{2}$ $\quad \therefore m = 6$ $\quad \therefore y = \frac{6}{x}$

2 at $x = 3$ $\quad \therefore y = \frac{6}{3}$ $\quad \therefore y = 2$

5

[a] $f(x) = 4 - x^2$

x	-3	-2	-1	0	1	2	3
$f(x)$	-5	0	3	4	3	0	-5



From the graph :

1 The vertex of the curve is : (0 , 4)

2 The equation of the axis of symmetry is : $x = 0$

[b] Form the table by yourself

, then the mean $(\overline{X}) = 8$, $\sigma = 4$

15 Beni Suef

1

1 c 2 a 3 b 4 d 5 b 6 d

2

[a] 1 $X \times Z = \{(2, 3), (5, 3)\}$

2 $Y^2 = \{(3, 3), (3, 2), (2, 3), (2, 2)\}$

3 $X \cap Y = \{2\}$

$, (X \cap Y) \times Z = \{2\} \times \{3\} = \{(2, 3)\}$

[b] Let the number be x

$\therefore \frac{5 + x^2}{11 + x^2} = \frac{3}{5}$ $\therefore 25 + 5x^2 = 33 + 3x^2$

$\therefore 2x^2 = 8$ $\therefore x^2 = 4$

$\therefore x = 2$ or $x = -2$ (refused)

$\therefore$ The number is 2

3

[a] 1 $f(3) + 3g(\sqrt{2}) = 3^2 - \sqrt{2} \times 3 + 3(\sqrt{2} + 1)$

$= 9 - 3\sqrt{2} + 3\sqrt{2} + 3 = 12$

2 $f(\sqrt{2}) = (\sqrt{2})^2 - \sqrt{2} \times \sqrt{2} = 2 - 2 = 0$

$, g(-1) = -1 + 1 = 0$

$\therefore f(\sqrt{2}) = g(-1)$

[b] 1 $\because y \propto \frac{1}{x}$ $\therefore y = \frac{m}{x}$

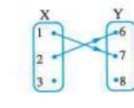
$\therefore 3 = \frac{m}{2}$ $\therefore m = 6$ $\therefore y = \frac{6}{x}$

2 at $x = 1.5$ $\therefore y = \frac{6}{1.5}$ $\therefore y = 4$

4

[a] $R = \{(1, 7), (2, 6)\}$

R is not a function because the element $3 \in X$ has no image in Y



[b] $\because \frac{x}{3} = \frac{y}{4} = \frac{z}{5} = m$

$\therefore x = 3m$, $y = 4m$, $z = 5m$

$\therefore$ L.H.S. $= \frac{2y - z}{3x - 2y + z} = \frac{8m - 5m}{9m - 8m + 5m}$

$= \frac{3m}{6m} = \frac{1}{2} =$ R.H.S.

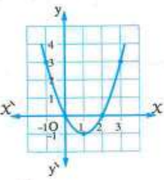
5

[a] Form the table by yourself

, then the mean $(\overline{x}) = 10$, $\sigma = 4$

[b] $f(x) = x^2 - 2x$

x	-1	0	1	2	3
$f(x)$	3	0	-1	0	3



From the graph :

* The equation of the axis of symmetry is : $x = 1$
* The minimum value $= -1$

16 El-Menia

1

1 a 2 c 3 b 4 d 5 a 6 b

2

[a] Form the table by yourself , then $\sigma \simeq 2.83$

[b] 1 $n(X \times Z) = 2$

2 $Y \cap X = \{2\}$

$, (Y \cap X) \times Z = \{2\} \times \{3\} = \{(2, 3)\}$

3

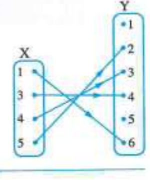
[a] 1 $\because y \propto \frac{1}{x}$ $\therefore xy = m$

$\therefore 2 \times 3 = m$ $\therefore m = 6$ $\therefore xy = 6$

2 at $x = 1.5$ $\therefore 1.5y = 6$ $\therefore y = 4$

[b] $R = \{(1, 6), (3, 4), (4, 3), (5, 2)\}$

R is a function because every element in X has only one image in Y



4

[a] $\because \frac{x}{y} = \frac{2}{3} = m$ $\therefore x = 2m , y = 3m$

$\therefore \frac{3x + 2y}{6y - x} = \frac{6m + 6m}{18m - 2m} = \frac{12m}{16m} = \frac{3}{4}$

[b] $\because$ The straight line intersects the X-axis at (2 , b)

$\therefore$ b = 0

, $\because$ (2 , 0) belongs to the striaght line

$\therefore 4 \times 2 - a = 0$ $\quad \therefore 8 - a = 0$ $\quad \therefore a = 8$

5

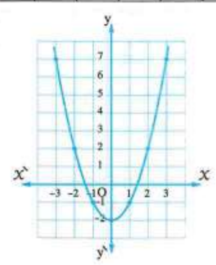
[a] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore$ L.H.S. $= \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + ac}{ac + c^2} = \frac{a(a + c)}{c(a + c)} = \frac{a}{c} =$ R.H.S.

[b] $f(X) = X^2 - 2$

X	-3	-2	-1	0	1	2	3
$f(X)$	7	2	-1	-2	-1	2	7



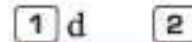
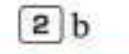
From the graph :

* The vertex of the curve is : $(0 , -2)$
* The equation of the axis of symmetry is : $X = 0$
* The minimum value $= -2$

17 Assiut



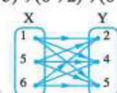
1

1 d $\quad$ 2 b $\quad$ 3 c $\quad$ 4 b $\quad$ 5 a $\quad$ 6 d

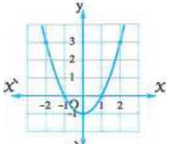
2

[a] $X \times Y = \{(1 , 2) , (1 , 4) , (1 , 5) , (5 , 2) , (5 , 4) , (5 , 5) , (6 , 2) , (6 , 4) , (6 , 5)\}$



[b] $f(X) = X^2 - 1$

X	-2	-1	0	1	2
$f(X)$	3	0	-1	0	3



From the graph :

1 The equation of the axis of symmetry is : $X = 0$

2 The minimum value $= -1$

3

[a] $\because f(3) = 15$ $\quad \therefore 15 = 4 \times 3 + m$

$\therefore 12 + m = 15$ $\quad \therefore m = 3$

[b] $\because \frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3X}$

, multiplying the two terms of the 1st ratio by 2 , the 2nd ratio by (-1) and the 3rd ratio by 5 and adding the antecedents and consequents of the three ratios.

$\therefore \frac{2a - b + 5c}{4 - 3 + 20} =$ one of the given ratios.

$\therefore \frac{2a - b + 5c}{21} = \frac{2a - b + 5c}{3X}$

$\therefore 3X = 21$ $\quad \therefore X = 7$

4

[a] 1 $\because y \propto X$ $\quad \therefore y = mX$

$\therefore 3 = 2m$ $\quad \therefore m = \frac{3}{2}$ $\quad \therefore y = \frac{3}{2}X$

2 at $X = \frac{1}{3}$ $\quad \therefore y = \frac{3}{2} \times \frac{1}{3}$ $\quad \therefore y = \frac{1}{2}$

[b] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore$ L.H.S. $= \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + ac}{ac + c^2} = \frac{a(a + c)}{c(a + c)} = \frac{a}{c} =$ R.H.S.

5

[a] 1 $R = \{(1 , 6) , (3 , 4) , (5 , 2)\}$

2 R is a function because every element in X has only one image in Y

, the range $= \{2 , 4 , 6\}$

[b] Form the table by yourself

, then the mean $(\overline{X}) = 7$, $\sigma \simeq 1.41$

18 Souhag

1

1 c $\quad$ 2 d $\quad$ 3 c $\quad$ 4 c $\quad$ 5 c $\quad$ 6 d



2

[a] $\because \frac{X}{y} = \frac{3}{4} = m$ $\quad \therefore X = 3\,m \,,\, y = 4\,m$

$\therefore \frac{3X + y}{X + 5y} = \frac{9\,m + 4\,m}{3\,m + 20\,m} = \frac{13\,m}{23\,m} = \frac{13}{23}$

[b] $R = \left\{(1 \,,\, 1) \,,\, \left(2 \,,\, \frac{1}{2}\right) \,,\, \left(3 \,,\, \frac{1}{3}\right)\right\}$

R is a function because every element in X has only one image in Y

3

[a] [1] $\because$ R is a function on X

$\therefore$ Each element in X has to appear only once as a first projection in R

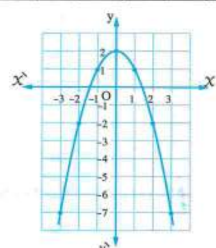
$\therefore a = 5 \,,\, b = 7$ or $a = 7 \,,\, b = 5$

$\therefore a + b = 5 + 7 = 12$

[2] The range $= \{5 \,,\, 7\}$

[b] $f(X) = 2 - X^2$

X	−3	−2	−1	0	1	2	3
$f(X)$	−7	−2	1	2	1	−2	−7



From the graph :

[1] The vertex of the curve is : $(0 \,,\, 2)$

[2] The equation of the axis of symmetry is : $X = 0$

[3] The maximum value = 2

4

[a] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore \text{L.H.S.} = \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + ac}{ac + c^2} = \frac{a(a + c)}{c(a + c)} = \frac{a}{c} = \text{R.H.S.}$

[b] [1] The variation is inverse

[2] $\because y \propto \frac{1}{X}$ $\quad \therefore X y = m$ $\quad \therefore m = 12$

[3] at $X = 2\frac{2}{5}$ $\quad \therefore \left(2\frac{2}{5}\right) y = 12$

$\therefore y = 12 \times \frac{5}{12} = 5$

5

[a] $\because (a \,,\, 3)$ lies on the straight line which represents the function.

$\therefore f(a) = 3$ $\quad \therefore 4a - 5 = 3$

$\therefore 4a = 8$ $\quad \therefore a = 2$

[b] Form the table by yourself , then $\sigma \simeq 3.22$

19 Qena

1

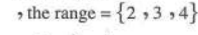
[1] a [2] c [3] b [4] b [5] a [6] c

2

[a] $R = \{(1 \,,\, 2) \,,\, (2 \,,\, 3) \,,\, (3 \,,\, 4)\}$

R is a function because every element in X has only one image in Y

, the range $= \{2 \,,\, 3 \,,\, 4\}$



[b] $\because \frac{a}{4} = \frac{b}{5} = \frac{c}{3} = m$

$\therefore a = 4\,m \,,\, b = 5\,m \,,\, c = 3\,m$

$\therefore \text{L.H.S.} = \frac{a - b + c}{a + b - c} = \frac{4\,m - 5\,m + 3\,m}{4\,m + 5\,m - 3\,m}$

$= \frac{2\,m}{6\,m} = \frac{1}{3} = \text{R.H.S.}$

3

[a] $\because y \propto X$ $\quad \therefore y = m X$ $\quad \therefore \frac{5}{6} = \frac{1}{6} m$

$\therefore m = 5$ $\quad \therefore y = 5 X$

, at $y = 15$ $\quad \therefore 15 = 5 X$ $\quad \therefore X = 3$

[b] $\because (a \,,\, -a)$ lies on the straight line that represents the function

$\therefore f(a) = -a$ $\quad \therefore a - 6 = -a$

$\therefore 2a = 6$ $\quad \therefore a = 3$

4

[a] $\because \frac{X}{y} = \frac{y}{z} = m$ $\quad \therefore y = z\,m \,,\, X = z\,m^2$

$\therefore \frac{X z}{y(y + z)} = \frac{z^2 m^2}{z\,m(z\,m + z)} = \frac{z^2 m^2}{z^2 m(m + 1)}$

$= \frac{m}{m + 1}$ (1)

$, \frac{X}{X + y} = \frac{z\,m^2}{z\,m^2 + z\,m} = \frac{z\,m^2}{z\,m(m + 1)} = \frac{m}{m + 1}$ (2)

From (1) , (2) : $\therefore \frac{X z}{y(y + z)} = \frac{X}{X + y}$

[b] 1 $X - Y = \{2, 3\}$

$, (X - Y) \times Z = \{2, 3\} \times \{4, 5\}$
$= \{(2, 4), (2, 5), (3, 4), (3, 5)\}$

2 $Y \cap Z = \{5\}$

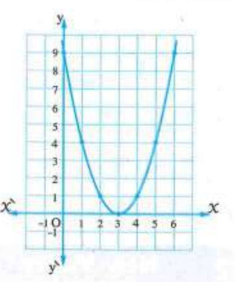
$, X \times (Y \cap Z) = \{2, 3\} \times \{5\}$
$= \{(2, 5), (3, 5)\}$



5

[a] $f(x) = (x - 3)^2$

x	0	1	2	3	4	5	6
$f(x)$	9	4	1	0	1	4	9



From the graph :

1 The vertex of the curve is : (3, 0)

2 The minimum value = 0

[b] Form the table by yourself

, then the mean $(\overline{X}) = 64$, $\sigma \simeq 7.07$





20 Luxor

1

1 c   2 b   3 d   4 c   5 b   6 d

2

[a] 1 $X \times Y = \{(2, 4), (2, 0), (1, 4), (1, 0)\}$

2 $Y \cap Z = \{4\}$

$(Y \cap Z) \times X = \{4\} \times \{2, 1\}$
$= \{(4, 2), (4, 1)\}$

3 $n(Y^2) = 4$

[b] Let the number be : x

$\therefore \frac{15 - x}{13 + x} = \frac{3}{4}$ $\therefore 39 + 3x = 60 - 4x$

$\therefore 7x = 21$ $\therefore x = 3$ $\therefore$ The number is : 3

3

[a] $\because f(2) + g(-4) = 30$

$\therefore 2 \times 2 + a + (-4)^2 + a = 30$

$\therefore 4 + a + 16 + a = 30$ $\therefore 2a + 20 = 30$

$\therefore 2a = 10$ $\therefore a = 5$

[b] $\because \frac{a}{b} = \frac{c}{d} = m$ $\therefore a = bm, c = dm$

$\therefore \frac{a + c}{b + d} = \frac{bm + dm}{b + d} = \frac{m(b + d)}{b + d} = m$ (1)

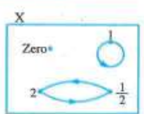
$, \frac{a^2 + c^2}{ab + cd} = \frac{b^2 m^2 + d^2 m^2}{b^2 m + d^2 m} = \frac{m^2 (b^2 + d^2)}{m(b^2 + d^2)} = m$ (2)

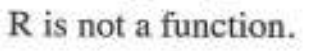
From (1), (2) : $\therefore \frac{a + c}{b + d} = \frac{a^2 + c^2}{ab + cd}$



4

[a] $R = \{(1, 1), (2, \frac{1}{2}), (\frac{1}{2}, 2)\}$





R is not a function.

[b] 1 $\because y \propto x^3$ $\therefore y = m x^3$ $\therefore 64 = 8m$

$\therefore m = 8$ $\therefore y = 8x^3$

2 at $x = \frac{1}{2}$ $\therefore y = 8 \times \left(\frac{1}{2}\right)^3$

$\therefore y = 8 \times \frac{1}{8} = 1$

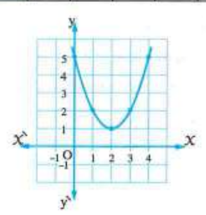
5

[a] Form the table by yourself

, then the mean $(\overline{X}) = 20$, $\sigma \simeq 1.26$

[b] $f(x) = x^2 - 4x + 5$

x	0	1	2	3	4
$f(x)$	5	2	1	2	5



From the graph :

1 The equation of the axis of symmetry is : $x = 2$

2 The minimum value = 1



21 Aswan

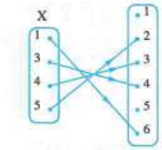
1

1 a 2 c 3 c 4 d 5 b 6 b

2

[a] 1 $R = \{(1, 6), (3, 4), (4, 3), (5, 2)\}$

2 R is a function because every element in X has only one image in Y



[b] 1 $\because y \propto x$ $\therefore y = m x$ $\therefore 6 = 3 m$

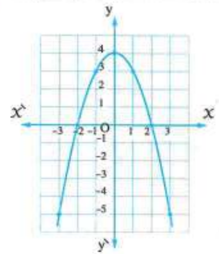
$\therefore m = 2$ $\therefore y = 2 x$

2 at $x = 5$ $\therefore y = 2 \times 5$ $\therefore y = 10$

3

[a] $f(x) = 4 - x^2$

x	−3	−2	−1	0	1	2	3
$f(x)$	−5	0	3	4	3	0	−5



From the graph :

* The vertex of the curve is : (0 , 4)
* The maximum value = 4
* The equation of the line of symmetry is : $x = 0$

[b] Let the number be x

$\therefore \frac{29 + x^2}{46 - x^2} = \frac{3}{2}$

$\therefore 58 + 2x^2 = 138 - 3x^2$

$\therefore 5x^2 = 80$ $\therefore x^2 = 16$

$\therefore x = 4$ or $x = -4$ (refused)

$\therefore$ The number is : 4

4

[a] $\because$ The straight line intersects the y-axis at (b , 2)

$\therefore b = 0$

, $\because$ (0 , 2) satisfies the function :

$\therefore 2 = 6 \times 0 - a$ $\therefore a = -2$

[b] Form the tables by yourself , then $\sigma \simeq 1.73$

5

[a] 1 The range = $\{3, 1, 5\}$

2 $\because$ R is a function on X

$\therefore$ Each element in X has to appear only once as a first projection in R

$\therefore a = 3, b = 5$ or $a = 5, b = 3$

$\therefore a + b = 3 + 5 = 8$

[b] $\because \frac{a}{b} = \frac{c}{d} = m$ $\therefore a = bm, c = dm$

$\therefore \frac{a}{b - a} = \frac{bm}{b - bm} = \frac{bm}{b(1 - m)} = \frac{m}{1 - m}$ (1)

, $\frac{c}{d - c} = \frac{dm}{d - dm} = \frac{dm}{d(1 - m)} = \frac{m}{1 - m}$ (2)

From (1) , (2) : $\therefore \frac{a}{b - a} = \frac{c}{d - c}$

22 New Valley

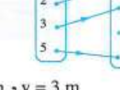
1

1 b 2 b 3 c 4 a 5 c 6 a

2

[a] 1 $R = \{(2, 4), (3, 6), (5, 10)\}$

2 R is a function because every element in X has only one image in Y



[b] $\because \frac{x}{y} = \frac{2}{3} = m$ $\therefore x = 2m, y = 3m$

$\therefore \frac{3x + 2y}{6y - x} = \frac{6m + 6m}{18m - 2m} = \frac{12m}{16m} = \frac{3}{4}$

3

[a] 1 $X = \{1\}, Y = \{1, 3, 5\}$

2 $Y \times X = \{(1, 1), (3, 1), (5, 1)\}$

3 $Y^2 = \{(1, 1), (1, 3), (1, 5), (3, 1), (3, 3), (3, 5), (5, 1), (5, 3), (5, 5)\}$

[b] $\because \frac{21x - y}{7x - z} = \frac{y}{z}$

$\therefore 7xy - yz = 21xz - yz$

$\therefore 7 x y = 21 x z \qquad \therefore y = \frac{21 x z}{7 x} = 3 z$

$\therefore y \propto z$

4

[a] $\because \frac{1}{3} f(3) = 5 \qquad \therefore f(3) = 15$

$\therefore 4 \times 3 + b = 15 \qquad \therefore 12 + b = 15 \qquad \therefore b = 3$

[b] $\because \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = m$

$\therefore c = d\,m ,\ b = d\,m^2 ,\ a = d\,m^3$

$\therefore \frac{a^2 - 3c^2}{b^2 - 3d^2} = \frac{d^2 m^6 - 3 d^2 m^2}{d^2 m^4 - 3 d^2} = \frac{d^2 m^2 (m^4 - 3)}{d^2 (m^4 - 3)} = m^2$ (1)

$, \frac{b}{d} = \frac{d\,m^2}{d} = m^2$ (2)

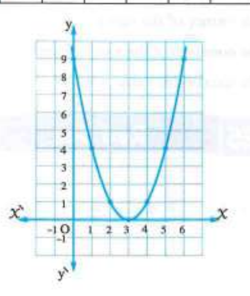
From (1) , (2) : $\therefore \frac{a^2 - 3c^2}{b^2 - 3d^2} = \frac{b}{d}$

5

[a] Form the table by yourself , then $\sigma \simeq 3.29$

[b] $f(x) = (x - 3)^2$

x	0	1	2	3	4	5	6
$f(x)$	9	4	1	0	1	4	9



From the graph :

* The vertex of the curve is : (3 , 0)
* The minimum value = 0
* The equation of the axis of symmetry is : $x = 3$

23 South Sinai

1




1 b 2 a 3 d 4 c 5 a 6 c

2

[a] 1 $Y \cap Z = \{2\}$

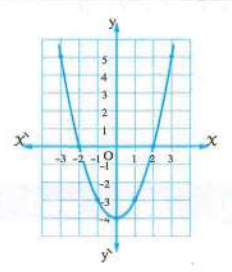
$, X \times (Y \cap Z) = \{1\} \times \{2\} = \{(1 , 2)\}$

2 $n(X \times Y) = 2$

3 $Z - Y = \{5 , 6\}$

[b] $f(x) = x^2 - 4$

x	−3	−2	−1	0	1	2	3
$f(x)$	5	0	−3	−4	−3	0	5

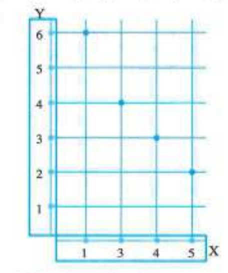


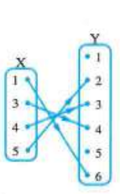
From the graph :

* The vertex of the curve is : (0 , − 4)
* The minimum value = − 4

3

$R = \{(1 , 6) , (3 , 4) , (4 , 3) , (5 , 2)\}$





R is a function because every element in X has only one image in Y

4

[a] $\because y \propto x \qquad \therefore \frac{y_1}{y_2} = \frac{x_1}{x_2}$

$\therefore \frac{6}{y_2} = \frac{3}{5} \qquad \therefore y_2 = \frac{6 \times 5}{3} = 10$

[b] Let the number be : x

$\therefore \frac{5+x^2}{11+x^2}=\frac{3}{5}$ $\quad \therefore 25+5x^2=33+3x^2$

$\therefore 2x^2=8$ $\quad \therefore x^2=4$

$\therefore x=2$ or $x=-2$ (refused)

$\therefore$ The number is : 2

5

[a] $\because \frac{a}{b}=\frac{b}{c}=\frac{c}{d}=m$

$\therefore c=dm \text{ , } b=dm^2 \text{ , } a=dm^3$

$\therefore \frac{c^2-d^2}{a-c}=\frac{d^2m^2-d^2}{dm^3-dm}=\frac{d^2(m^2-1)}{dm(m^2-1)}=\frac{d}{m}$ (1)

$\therefore \frac{bd}{a}=\frac{d^2m^2}{dm^3}=\frac{d}{m}$ (2)

From (1) , (2) : $\therefore \frac{c^2-d^2}{a-c}=\frac{bd}{a}$

[b] Form the tables by yourself , then $\sigma \simeq 1.73$

24 North Sinai

1

1 c 2 b 3 b 4 a 5 d 6 c

2

[a] 1 $R=\{(2,4),(3,6),(4,8)\}$

2 R is function because every element in X has only one image in Y , its range $=\{4,6,8\}$

[b] $\because y \propto x$ $\quad \therefore \frac{y_1}{y_2}=\frac{x_1}{x_2}$

$\therefore \frac{2}{y_2}=\frac{8}{12}$ $\quad \therefore y_2=\frac{12\times 2}{8}=3$

3

[a] $\because f(3)=15$ $\quad \therefore 4\times 3+b=15$

$\therefore 12+b=15$ $\quad \therefore b=3$

[b] $\because \frac{x}{y}=\frac{2}{3}=m$ $\quad \therefore x=2m$, $y=3m$

$\therefore \frac{3x+2y}{6y-x}=\frac{6m+6m}{18m-2m}=\frac{12m}{16m}=\frac{3}{4}$

4

[a] $\because (6, b-3)=(2-a, -1)$

$\therefore 2-a=6$ $\quad \therefore -a=4$ $\quad \therefore a=-4$

, $b-3=-1$ $\quad \therefore b=2$

$\therefore a+b=-4+2=-2$

[b] $\because$ b is the middle proportional between a and c

$\therefore b^2=ac$

$\therefore \text{L.H.S.}=\frac{a^2+b^2}{b^2+c^2}=\frac{a^2+ac}{ac+c^2}=\frac{a(a+c)}{c(a+c)}=\frac{a}{c}=\text{R.H.S.}$

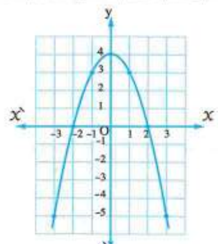
5

[a] Form the table by yourself

, then the mean $(\overline{X})=16$, $\sigma \simeq 3.9$

[b] $f(x)=4-x^2$

x	−3	−2	−1	0	1	2	3
$f(x)$	−5	0	3	4	3	0	−5



From the graph :

1 The vertex of the curve is : (0 , 4)

2 The equation of the axis of symmetry is : $x=0$

3 The maximum value = 4

25 Red Sea

1

1 c 2 b 3 d 4 a 5 b 6 c

2

[a] 1 $Y=\{2,5,7\}$

2 $X=\{2\}$, $X^2=\{2\}\times\{2\}=\{(2,2)\}$

[b] $\because 5a=3b$ $\quad \therefore \frac{a}{b}=\frac{3}{5}=m$

$\therefore a=3m$, $b=5m$

$\therefore \frac{7a+9b}{4a+2b}=\frac{21m+45m}{12m+10m}=\frac{66m}{22m}=3$

3

[a] 1 $\because y \propto \frac{1}{x}$ $\quad \therefore xy=m$

$\therefore 2\times 3=m$ $\quad \therefore m=6$ $\quad \therefore xy=6$

2 at $x=1.5$ $\quad \therefore (1.5)y=6$ $\quad \therefore y=4$

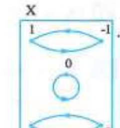
[b] 1 The vertex of the curve is : (0 , – 2)

2 The equation of the line of symmetry is : $X = 0$

3 The minimum value = – 2



[a] R = {(– 2 , 2) , (– 1 , 1) , (0 , 0) , (1 , – 1) , (2 , – 2)}



[b] $\because \frac{a}{b} = \frac{b}{c} = m$

$\therefore b = cm , a = cm^2$

$\therefore \frac{a-b}{a-c} = \frac{cm^2 - cm}{cm^2 - c} = \frac{cm(m-1)}{c(m^2-1)} = \frac{m(m-1)}{(m-1)(m+1)}$

$= \frac{m}{m+1}$ (1)

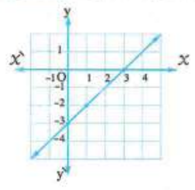
$, \frac{b}{b+c} = \frac{cm}{cm+c} = \frac{cm}{c(m+1)} = \frac{m}{m+1}$ (2)

From (1) , (2) : $\therefore \frac{a-b}{a-c} = \frac{b}{b+c}$



[a] $f(X) = X - 3$

X	0	1	3
$f(X)$	– 3	– 2	0



From the graph :

* The intersection point with X-axis is : (3 , 0)

* The intersection point with y-axis is : (0 , – 3)

[b] Form the table by yourself , then $\sigma \simeq 1.41$

Final Examinations 2020

on Algebra and Statistics



Model 1

Answer the following questions :

1 **Choose the correct answer from those given :**

1. The point (– 3 , 4) lies in the ·············· quadrant.
   (a) first (b) second (c) third (d) fourth

2. The positive square root of mean of the squares of deviations of values from its arithmetic mean is called ··············
   (a) the range. (b) the arithmetic mean.
   (c) the standard deviation. (d) the mode.

3. If 3 a = 4 b , then a : b = ··············
   (a) 3 : 4 (b) 4 : 3 (c) 3 : 7 (d) 4 : 7

4. If n (X) = 2 , $n(Y^2) = 9$, then n (X × Y) = ··············
   (a) 6 (b) 18 (c) 11 (d) 7

5. The range of the set of the values : 7 , 3 , 6 , 9 and 5 is ··············
   (a) 3 (b) 4 (c) 6 (d) 12

6. If $y \propto X$ and y = 2 when $X = 8$, then y = 3 when $X =$ ··············
   (a) 16 (b) 12 (c) 24 (d) 6

2 [a] If X × Y = {(2 , 2) , (2 , 5) , (2 , 7)}
, **find :** 1 Y   2 Y × X

[b] If a , b , c and d are proportional , **prove that :** $\frac{a}{b-a} = \frac{c}{d-c}$

3 [a] If X = {2 , 3 , 5} , Y = {4 , 6 , 8 , 10} and R is a relation from X to Y where "a R b" means "2 a = b" for all a ∈ X , b ∈ Y

1. Write R and represent it by an arrow diagram.
2. Show that R is a function.

[b] Find the number that if we add it to each term of the ratio 7 : 11 it becomes 2 : 3

4 **[a]** If $X = \{1, 3, 5\}$ and R is a function on X , where $R = \{(a, 3), (b, 1), (1, 5)\}$

, **find :**

1 The range of the function.

2 The value of a + b

[b] If $y \propto \frac{1}{X}$ and y = 3 when $X = 2$

, **find :**

1 The relation between X and y

2 The value of y when $X = 1.5$

5 **[a]** Represent graphically the function $f : f(X) = (X - 3)^2$, $X \in [0, 6]$, from the graph deduce the vertex of the curve , the minimum value of the function and the equation of the axis of symmetry.

[b] Calculate the arithmetic mean and the standard deviation of the set of values : 8 , 9 , 7 , 6 and 5

Model 2

Answer the following questions :

1 **Choose the correct answer from those given :**

1 The point (3 , 4) lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

2 .... is one of the measures of the dispersion.

(a) The median (b) The arithmetic mean

(c) The standard deviation (d) The mode

3 The third proportion of the two numbers 3 and 6 is ....

(a) $\frac{1}{2}$ (b) 9 (c) 2 (d) 12

4 If n (X) = 2 , n (Y × X) = 6 , then $n(Y^2) =$ ....

(a) 4 (b) 9 (c) 16 (d) 12

5 The range of the set of the values : 7 , 3 , 6 , 9 and 5 is ....

(a) 3 (b) 4 (c) 6 (d) 12

6 If $x y = 7$, then $y \propto$ ....

(a) $\frac{1}{x}$ (b) $x - 7$ (c) x (d) $x + 7$

2 [a] If $X = \{2, 5\}$, $Y = \{1, 2\}$, $Z = \{3\}$

, **find :** 1 $n(X \times Z)$

2 $(Y \cap X) \times Z$

[b] If b is the middle proportional between a and c, **prove that :** $\frac{a-b}{a-c} = \frac{b}{b+c}$

3 [a] If $X = \{1, 3, 4, 5\}$, $Y = \{1, 2, 3, 4, 5, 6\}$ and R is a relation from X to Y where "a R b" means "$a + b = 7$" for all $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Show that R is a function.

[b] If $5a = 3b$, **find the value of :** $\frac{7a+9b}{4a+2b}$

4 [a] If $f(x) = 4x + b$ and $f(3) = 15$, **find the value of : b**

[b] If $y \propto x$, $y = 6$ when $x = 3$, **find :**

1 The relation between x and y

2 The value of y when $x = 5$

5 [a] Represent graphically the function $f : f(x) = 4 - x^2$, $x \in [-3, 3]$, from the graph deduce the vertex of the curve, the maximum value of the function and the equation of the axis of symmetry.

[b] **The following frequency distribution shows the number of children of some families in a new city :**

Number of children	0	1	2	3	4	Total
Number of families	6	15	40	25	14	100

Calculate the mean and the standard deviation of the number of children.

Model for the merge students

Answer the following questions :

1 Complete :

1 The point (5 , 3) lies in .... quadrant.

2 n $(x) = x^3 + 8$ is called a polynomial of .... degree.

3 The range of the set of the values : 4 , 14 , 25 and 34 is ....

4 If $y = 2x$, then $y \propto$ ....

5 If $X = \{2, 4, 6\}$, then $n(X^2) =$ ....

6 If (a , 3) = (6 , b) , then a + b = ...

2 Choose the correct answer from those given :

1 If $xy = 7$, then $y \propto$ ....

(a) $\frac{1}{x}$ (b) $x - 7$ (c) x (d) $x + 7$

2 If 2 , 3 , 6 and x are proportional , then $x =$ ....

(a) 9 (b) 18 (c) 12 (d) 3

3 If 2 a = 5 b , then $\frac{a}{b} =$ ....

(a) $\frac{-5}{2}$ (b) $\frac{-2}{5}$ (c) $\frac{2}{5}$ (d) $\frac{5}{2}$

4 .... is one of the measures of the dispersion.

(a) The arithmetic mean (b) The range

(c) The mode (d) The median

5 If n (X) = 5 , n (X × Y) = 10 , then n (Y) = ...

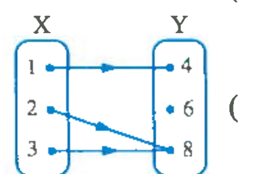
(a) 4 (b) 3 (c) 2 (d) 1

6 If $X = \{1\}$, then $X^2 =$ ....

(a) 1 (b) (1 , 1) (c) $\{(1, 1)\}$ (d) $\{1\}$

3 Put (✓) or (✗) :

1. If the function $f = \{(1 , 3) , (2 , 4) , (3 , 3)\}$
   , then the domain of the function is $\{1 , 2 , 3\}$ ( )
2. If $y \propto X$ and $y = 6$ when $X = 3$, then $y = 2$ when $X = 4$ ( )
3. If $\sum \left(X - \overline{X}\right)^2 = 36$ for a set of values whose number equals 9 , then $\sigma = 4$ ( )
4. The intersection point of the straight line $f(X) = X + 2$
   with X-axis is the point $(-2 , 0)$ ( )
5. If $f : X \longrightarrow Y$, then X is called the domain of this function. ( )
6. The arrow diagram from X to Y
   is a function. ( )



4 Join from column (A) to column (B) :

(A)	(B)
1 If $(1 , 4) \in \{2 , X\} \times \{1 , 4\}$, then $X =$	• 6
2 If the function f where $f(X) = X - 4$ is represented graphically by a straight line passing through the point $(a , 2)$, then $a =$	• 1
3 $\frac{1}{2} = \frac{3}{6} = \frac{4}{8} = \frac{\cdots\cdots}{16}$	• 10
4 If $f(X) = 5$, then $f(5) + f(-5) =$	• ± 6
5 The middle proportional of the two numbers 4 and 9 is	• 2
6 **In the opposite figure :** The equation of the line of symmetry is $X =$	• 8



1 Cairo Governorate



Answer the following questions : *(Calculator is allowed)*

1 Choose the correct answer from those given :

1. The simplest dispersion measure is ....
   (a) the arithmetic mean. (b) the median.
   (c) the range. (d) the mode.

2. $2x^2 \times 3x =$ ....
   (a) $6x^3$ (b) $5x^3$ (c) $6x^2$ (d) $5x^2$

3. If $X = \{3\}$, $n(Y) = 5$, then $n(X \times Y) =$ ....
   (a) 1 (b) 5 (c) 8 (d) 15

4. The simplest form of the expression : $3x - 4y + 5x + 7y$ is ....
   (a) $7x + 12y$ (b) $11xy$ (c) $10x + 9y$ (d) $8x + 3y$

5. The relation which represents an inverse variation between the two variables y and x is ....
   (a) $xy = 5$ (b) $y = x + 3$ (c) $\frac{x}{5} = \frac{y}{2}$ (d) $y = 2x$

6. If $\sqrt{x} = 4$, then $x =$ .... where $x \in \mathbb{Z}^+$
   (a) 2 (b) 4 (c) 8 (d) 16

2 **[a]** Graph the curve of the function $f : f(x) = x^2$ where $x \in [-3, 3]$
, from the graph find :

1. The maximum or the minimum value of the function.
2. The equation of the axis of symmetry.

[b] Find the standard deviation to the set of the values : 15 , 19 , 20 , 21 , 25

3 **[a]** If $X = \{3, 4\}$, $Y = \{4, 5\}$, $Z = \{5, 6\}$, **find :**

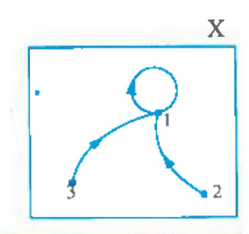
1. $X \times Y$
2. $(X - Y) \times Z$

[b] If x , y , z and ℓ are proportional quantities , **prove that :** $\frac{y - x}{x} = \frac{\ell - z}{z}$

4 **[a]** Find the number which if added to both of terms of the ratio 3 : 5 , then it becomes 1 : 2

[b] In the opposite figure :

The arrow diagram represents the relation R on the set X



1. Write R
2. Is R a function ? If it's , find its range.

5 **[a]** If $y \propto X$ and $y = 20$ as $X = 4$, **find :**

1. The constant of variation between y and X
2. The value of X when $y = 40$

[b] If $f(X) = 2X + k$, $f(5) = 13$, **find the value of :** k

2 Giza Governorate



Answer the following questions :

1 **Choose the correct answer :**

1. Double the number 2^8 is ....

   (a) 2^{10} (b) 2^{16} (c) 4^8 (d) 2^9

2. If $X y = 3$, then $y \propto$ ....

   (a) X (b) $3X$ (c) $\frac{1}{X}$ (d) $\frac{1}{3}X$

3. If $X^2 + y^2 = 25$, $(X + y)^2 = 49$, then $X y =$ ....

   (a) 6 (b) 10 (c) 12 (d) 24

4. If $f(X) = 3$, then $f(3) + f(-3) =$ ....

   (a) 0 (b) 1 (c) -6 (d) 6

5. $]-2 , 5[\cup \{-2 , 5\} =$ ....

   (a) $[-2 , 5]$ (b) $[-2 , 5[$ (c) $]-2 , 5]$ (d) $]-2 , 5[$

6. The range of the set of the values : 5 , 14 , 4 , 23 , 15 is ....

   (a) 12 (b) 14 (c) 19 (d) 23

2 **[a]** If $X = \{2 , 5\}$, $Y = \{1 , 2\}$, $Z = \{3\}$, **then find :**

1. $n(X \times Z)$
2. $(Y \cap X) \times Z$

[b] If $f(X) = 4X + b$, $f(2) = 10$, **then find the value of :** b

3 **[a]** If $X = \{2, 3, 5\}$, $Y = \{4, 6, 8, 10\}$ and R is a relation from X to Y where "a R b" means "$a = \frac{b}{2}$" for each $a \in X$, $b \in Y$, write R and represent it by an arrow diagram. Is R a function ? and why ?

[b] Find the number which if added to the two terms of the ratio 7 : 11 , it will be 2 : 3

4 **[a]** If 2 a = 3 b = 3 c , **then find the numerical value of :** $\frac{6a + b + c}{4a + 6b + 6c}$

[b] Calculate the standard deviation for the following values : 55 , 53 , 57 , 56 , 54

5 **[a]** If $y \propto x$ and y = 6 when $x = 3$, **find :**

1. The relation between x , y
2. The value of y when $x = 4$

[b] Represent graphically the curve of the function $f : f(x) = 4 - x^2$ where $x \in [-3, 3]$ and from the graph deduce the vertex of the curve and the equation of the symmetry axis.

3 Alexandria Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer from those given :**

1. If n (X) = 5 , n (X × Y) = 10 , then n (Y) = ...
   (a) 4 (b) 3 (c) 2 (d) 1
2. If $x = \frac{1}{\sqrt{3} + \sqrt{2}}$, $y = \sqrt{3} + \sqrt{2}$, then $(x + y)^2 = $ ....
   (a) 12 (b) $2\sqrt{3}$ (c) $2\sqrt{2}$ (d) zero
3. The arithmetic mean of the set of values : 8 , 9 , 7 , 6 and 5 equals ....
   (a) 25 (b) 7 (c) 35 (d) 5
4. For any set Y , then $\varnothing$ .... Y
   (a) $\in$ (b) $\notin$ (c) $\subset$ (d) $\not\subset$
5. The relation representing the direct variation between the two variables x and y is ....
   (a) $xy = 5$ (b) $y = x + 3$ (c) $\frac{x}{3} = \frac{4}{y}$ (d) $\frac{x}{5} = \frac{y}{2}$
6. $2^{100} = 2^{99} + $ ....
   (a) 2 (b) 1 (c) 2^{99} (d) 99

2 **[a]** If $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 3x$, mention the degree of f **, then find :** $f(-2)$, $f\left(\sqrt{3}\right)$

[b] If 5 a = 3 b , **then find the value of :** $\frac{7a + 9b}{4a + 2b}$

3 **[a]** If $X = \{-1, 1, 2\}$, $Y = \{2, 4, 6, 8\}$ and R is a relation from X to Y where "a R b" means "b = 2 a + 4" for all $a \in X$, $b \in Y$, write R and represent it by an arrow diagram. Is R a function ? Why ?

[b] If $x^4 y^2 - 14 x^2 y + 49 = 0$, **prove that :** $y \propto \frac{1}{x^2}$

4 **[a]** If $(x - 2, 3) = (5, y + 1)$, **find the value of each of :** x , y

[b] The following frequency distribution shows the number of children of some families in a new city :

Number of children	0	1	2	3	4
Number of families	8	16	50	20	6

Calculate the mean and standard deviation to the number of children.

5 **[a]** If a , b , c and d are in continued proportion , **then prove that :** $\frac{a}{b + d} = \frac{c^3}{c^2 d + d^3}$

[b] Represent graphically the function f where $f(x) = x^2 + 2x + 1$, taking $x \in [-4, 2]$ **and from the drawing deduce :**

1. The coordinates of the vertex of the curve.
2. The equation of the symmetry axis.
3. The minimum or the maximum value of the function.

4 El-Kalyoubia Governorate



Answer the following questions :

1 **Choose the correct answer :**

1. $\sqrt[3]{x^6} = \sqrt{\cdots\cdots\cdots}$
   (a) x^3 (b) x^2 (c) x (d) x^4
2. If $(x + 5, 8) = (1, 6y + x)$, then y = ……………
   (a) 5 (b) 6 (c) 2 (d) 12
3. The solution set of the equation : $x^2 + 4 = 0$ in $\mathbb{R}$ is ……………
   (a) $\{4\}$ (b) $\{-2, 2\}$ (c) $\{-2\}$ (d) $\varnothing$
4. If $x y = 7$, then $y \propto$ ……………
   (a) $\frac{1}{x}$ (b) $x - 7$ (c) x (d) $x + 7$
5. If $x^2 - y^2 = 16$ and $x + y = 8$, then $x - y =$ ……………
   (a) 2 (b) 1 (c) 128 (d) 64
6. If $\sum (x - \bar{x})^2 = 36$ to the set of 9 values , then $\sigma =$ ……………
   (a) 2 (b) 4 (c) 18 (d) 27

2 **[a]** Represent graphically the function f where $f(X) = (X - 2)^2$, $X \in [0 , 4]$

From the graph , deduce :

1 The equation of the symmetry axis.

2 The maximum (minimum) value of the function.

[b] If $y \propto \frac{1}{X}$ and $X = 2\frac{4}{5}$ when $y = \frac{4}{7}$, find the value of y when $X = 3\frac{1}{5}$

3 **[a]** If $X = \{2 , 3 , 5\}$, $Y = \{4 , 6 , 8 , 10\}$ and R is a relation from X to Y , where "a R b" means "2 a = b" for each $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Is R a function ?

[b] If a , b , c and d are proportional , **prove that :** $\sqrt[3]{\frac{5a^3 - 3c^3}{5b^3 - 3d^3}} = \frac{a + c}{b + d}$

4 **[a]** If $X = \{2 , 4\}$, $Y = \{4 , 0\}$, $Z = \{4 , 5 , -2\}$, **find :**

1 $(Z - Y) \times (X \cap Y)$ **2** $n(X^2)$

[b] If $f(X) = 4X + b$, $f(3) = 15$, **find the value of :** b

5 **[a]** If $\frac{a}{2X + y} = \frac{b}{3y - X} = \frac{c}{4X + 5y}$, **prove that :** $\frac{a + 2b}{7} = \frac{4b + c}{17}$

[b] Find the standard deviation for this distribution :

X	zero	1	2	3	4	5	Total
K	3	16	17	25	20	19	100

5 El-Sharkia Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer from those given :**

1 If the arithmetic mean of the quantities $2X$, 3 , 4 , 5 equals 4 , then $X =$ ....

(a) 1 (b) 2 (c) 3 (d) 4

2 If $X \times Y = \{(1 , 2) , (3 , 4)\}$, then $X \cap Y =$ ....

(a) $\{1 , 2\}$ (b) $\{(3 , 4)\}$ (c) $\varnothing$ (d) $\{1 , 4\}$

3 If $y = mX$ where m is a constant $\neq$ zero , which of the following statements is false ?

(a) $y \propto X$ (b) $X \propto y$ (c) $X = \frac{1}{m}y$ (d) $X \propto \frac{1}{y}$

4 If a , b , c , d are proportional quantities , then $\frac{a\,d - b\,c}{a^2 + b^2 + c^2} = \cdots\cdots$

(a) zero (b) 1 (c) 2 (d) 3

5 $f : f(x) = (2a - 2)\,x^3 + 3\,x^2 + x + 2$ is a polynomial function from the second degree when a = ……

(a) zero (b) 2 (c) 3 (d) 1

6 If the point (a – 5 , 5 – a) lies in the fourth quadrant , then ……

(a) $a \geq 5$ (b) $a \leq 5$ (c) $a > 5$ (d) $a < 5$

2 [a] If $X = \{1 , 2 , 3\}$, $Y = \{3 , 4\}$, **find :**

1 $X - Y$ 2 $(Y \cap X) \times Y$ 3 $n(Y^2)$

[b] If a , b , c and d are in continued proportional , **prove that :** $\frac{b + d}{c^2\,d + d^3} = \frac{a}{c^3}$

3 [a] If $X = \left\{\frac{1}{2} , 1 , \text{zero} , -\frac{1}{2} , -1\right\}$, $Y = \{1 , 2 , \text{zero} , -1 , -2\}$

and R is a relation from X to Y where " a R b " means "a is the multiplicative inverse of b" for each $a \in X$ and $b \in Y$

Write R and represent it by an arrow diagram. Is R a function ? and why ?

[b] If y varies inversely as x^2 where $y = 9$ at $x = \frac{2}{3}$

, **find :** 1 The relation between y and x

2 The value of y when $x = \frac{1}{2}$

4 [a] Represent graphically the quadratic function f where $f(x) = (x - 3)^2 + 1$ taking $x \in [0 , 6]$ **From the graph deduce :**

1 The coordinates of the vertex of the curve.

2 The minimum value of the function.

3 The equation of the axis of symmetry of the curve.

[b] If $\frac{x}{3} = \frac{y}{2} = \frac{z}{5}$, **find the value of :** $\frac{x\,y + y\,z}{x^2 + y^2}$

5 [a] **Calculate the standard deviation for the values :** 12 , 13 , 16 , 18 , 21

[b] If $f(x) = a\,x + b$ and $f(a) = b$

Find the value of the expression : $a\,b^2 + 5$



6 El-Monofia Governorate



Answer the following questions : *(Using calculator is permitted)*

1 Choose the correct answer from those given :

1 The number 3 belongs to the solution set of the inequality ....

(a) $x > 3$ (b) $x < 3$ (c) $-x \geq -3$ (d) $-x \geq 3$

2 $\left(\frac{-3}{4}\right)^{zero}$ .... $\left(\frac{-3}{4}\right)^2$

(a) < (b) > (c) = (d) ≤

3 The number lying between 0.02 and 0.03 is ....

(a) 0.00025 (b) 0.0025 (c) 0.025 (d) 0.25

4 If a < 5 , then the point (2 , a – 5) lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

5 If $\frac{a}{3} = \frac{b}{5}$, then 5 a – 3 b + 4 = ...

(a) 3 (b) 4 (c) 5 (d) 6

6 If $\sum (x - \overline{x})^2 = 48$ of a set of values and the number of these values is 12 , then σ = ...

(a) 2 (b) – 2 (c) – 4 (d) 4

2

[a] If X = {– 1 , 1 , 2} , Y = {2 , 4 , 6 , 8} , R is a relation from X to Y where "a R b" means "b = 2 a + 4" for each a ∈ X and b ∈ Y

1 Write R and represent it by an arrow diagram.

2 Show that R is a function and write its range.

[b] If the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 6x - a$ cuts y-axis at the point (b , 3) , **find the value of :** 2 a – 5 b

3

[a] If X = {1} , Y = {2 , 3} , Z = {3 , 4 , 5} , **find each of the following :**

1 X × Y 2 X × (Y – Z) 3 n (Z^2)

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2} = \frac{b^2 + c^2}{c^2}$

4

[a] If a : b : c = 2 : 3 : 5 and a + b + c = 35 , **then find the value of each of :** a , b and c

[b] If y = a + 7 , $a \propto \frac{1}{x^2}$ and a = 3 when $x = 2$, **then find :**

1 The relation between x and y 2 The value of y when $x = \sqrt{3}$

5 **[a]** Draw the curve of the function $f : f(X) = X^2 - 4X$, taking $X \in [-1, 5]$

and from the graph find :

1. The coordinates of the vertex of the curve.
2. The equation of the line of symmetry.
3. The maximum or the minimum value of the function.

[b] Find the standard deviation for the following set of values : 20 , 27 , 5 , 16 , 32



7 El-Gharbia Governorate



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer :**

1. The following functions are polynomial functions except the function f where $f(X) =$ ....
   (a) $X + 3$ (b) $\sqrt{2}\,X + 1$ (c) $X\left(X + \frac{1}{X}\right)$ (d) $X^2(X + 4)$
2. The solution set of the equation : $(X - 5)^{zero} = 1$ in $\mathbb{R}$ is ....
   (a) $\{5\}$ (b) $\{5, -5\}$ (c) $\mathbb{R}$ (d) $\mathbb{R} - \{5\}$
3. If $(a - 7, 26) = (-3, b^3 - 1)$, then $\sqrt{a^2 + b^2} =$ ....
   (a) 5 (b) -5 (c) ± 5 (d) ± 7
4. The second proportional to the numbers 2 , ... , 8 is ....
   (a) 4 (b) 6 (c) ± 4 (d) ± 6
5. The range of the set of the values : 7 , 3 , 6 , 9 , 5 is ....
   (a) 3 (b) 4 (c) 6 (d) 12
6. If $y \propto X$ and $y = 2$ when $X = 8$, then $y = 3$ when $X =$ ....
   (a) 16 (b) 12 (c) 24 (d) 6

2 **[a]** If $X = \{-2, -3, 2\}$, $Y = \left\{\frac{1}{8}, \frac{1}{27}, 8\right\}$ and R is a relation from X to Y where "a R b" means "$a^3 = b$" for all $a \in X$, $b \in Y$, write R , and represent it by an arrow diagram. Is R a function or not with a reason ?

[b] If $X^4 y^2 - 14X^2 y + 49 = 0$, **then prove that :** $y \propto \frac{1}{X^2}$

3 **[a]** If a , b , c and d are proportional quantities, **then prove that :** $\frac{a + b}{b} = \frac{c + d}{d}$

[b] Represent graphically the curve of the function $f : f(X) = 2 - X^2$, taking $X \in [-3, 3]$ and from the graph deduce the equation of the axis of symmetry, the maximum value or the minimum value of the function.

4 **[a]** If $X \times Y = \{(1, 1), (1, 3), (1, 5)\}$, find Y^2 and represent it by a Cartesian diagram.

[b] Find the positive number which if we add its square to each of the two terms of the ratio 5 : 11, it becomes 3 : 5

5 **[a]** If the straight line representing the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(X) = 6X - \ell$ cuts the y-axis at the point (m, 3), **find the value of each of :** ℓ and m

[b] Calculate the arithmetic mean and the standard deviation for the following data : 23, 12, 17, 13, 15 rounding the result of the standard deviation to one decimal place.

8 El-Dakahlia Governorate



Answer the following questions : ***(Calculator is permitted)***

1 **[a] Choose the correct answer from those given :**

1 If $5X = 9y$, then $\frac{3X}{2y} =$ ....

(a) 27 : 10 (b) 9 : 5 (c) 5 : 9 (d) 81 : 25

2 In the opposite figure :

The curve of a quadratic function, A (– 4, 0), then the equation of the axis of symmetry is $X =$ ....



(a) 1 (b) – 1

(c) – 2 (d) 0

3 The number added to each of the numbers 1, 3, 6 to be proportional is ....

(a) 4 (b) 3 (c) 1 (d) 2

[b] If b is the middle proportional between a and c, **prove that :** $\frac{a^2}{b^2} + \frac{b^2}{c^2} = \frac{2a}{c}$

2 **[a] Choose the correct answer from those given :**

1 If $f(X + 3) = X - 3$, then $f(7) =$ ....

(a) 4 (b) 1 (c) 7 (d) 10

2 If $\Sigma (X - \overline{X})^2 = 36$ for 9 values, then the standard deviation = ...

(a) 2 (b) 18 (c) 27 (d) 4

3 If $f(X) = 3$, then $f(2) - f(7) =$ ....

(a) 5 (b) – 5 (c) 0 (d) – 4

[b] If $X = \{4, 5, 7\}$, R is a function on X and $R = \{(a, 5), (b, 5), (4, 7)\}$, **find :**

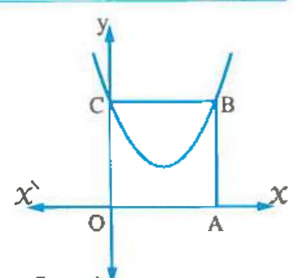
1 The value of 3 a + 3 b

2 The range of the function.

3 **[a]** If $\frac{a}{4X+y}=\frac{b}{X-4y}$, **prove that :** $\frac{a+b}{5X-3y}=\frac{a-b}{3X+5y}$

[b] Calculate the standard deviation of values : 12 , 13 , 16 , 18 , 21

4 **[a]** The opposite figure represents the curve of the function f where $f(X)=X^2-(k-2)X-k+4$, the figure OABC is a square.
Find the value of : k



[b] If y = 1 + b , b varies inversely with the square of X , $X=1$ at y = 5 , find the relation between X and y , then find the value of y at $X=2$

5 **[a]** If $f(X)=a+X^2$, $\ell(X)=c$ are two polynomial functions where $3f(2)+3\ell(X)=6$, **find the numerical value of :** $2f(0)+2\ell(7)$ where a and c are constants.

[b] If X = {3 , 5 , 7} , Y = $\{X : X \in \mathbb{N} , 10 < X < 30\}$ and the function f from X ⟶ Y is $f=\{(3,9),(5,15),(7,21)\}$

1 Find the domain of f 2 Write the rule of the function.

9 Ismailia Governorate



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from those given :**

1 The expectation of the match of Ismaili club in mathematics is called ....
(a) probability. (b) equations. (c) inequalities. (d) relations.

2 The third proportional of the quantities 2 , 3 and 6 is ....
(a) 1 (b) 4 (c) 9 (d) 12

3 The number $\frac{2X}{X-5}$ is a rational number if $X \neq$ ....
(a) zero (b) $\frac{1}{5}$ (c) $\frac{2}{5}$ (d) 5

4 If the point (b – 4 , 2 – b) lies in the third quadrant, then b = ...
(a) 2 (b) 3 (c) 4 (d) 6

5 If $17X+8=11$, then $17X+11=$ ....
(a) 8 (b) 11 (c) 14 (d) 17

6 If a set of values are equal , then the dispersion of these values is ....
(a) > zero (b) < zero (c) = 1 (d) = zero

2 **[a]** If $X = \{2, 3\}$, $Y = \{3, 4, 5\}$, **find :**

1 $X \times Y$ 2 X^2 3 $n(Y^2)$

[b] If $3a = 4b$, **find the value of :** $\frac{2a + b}{5a - 3b}$

3 **[a]** If y varies inversely with the square of x and $y = 5$ when $x = 3$, find the value of y when $x = 2$

[b] If the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 3x - a$ cuts the y-axis at the point (b , 5)

, **find the values of :** a and b

4 **[a]** If we add double the number x to each of the numbers 1 , 3 and 7 , it becomes proportional quantities. **Find the value of :** x

[b] If $X = \{-1, 1, 2\}$, $Y = \{2, 4, 6, 8\}$ and R is a relation from X to Y where "a R b" means "$b = 2a + 4$" for all $a \in X$, $b \in Y$

1 Find the relation R and represent it by an arrow diagram.

2 Is R a function ? and why ?

5 **[a]** Represent graphically the curve of the function $f : f(x) = 2 - x^2$ where $x \in [-3, 3]$, **then from the graph find :**

1 The coordinates of the vertex of the curve.

2 The equation of the axis of symmetry.

3 The maximum or minimum value of the function.

[b] **Calculate the standard deviation of the values :** 12 , 13 , 16 , 18 , and 21

10 Suez Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer from those given :**

1 If 2 , 3 , 6 and x are proportional , then $x =$ ....

(a) 9 (b) 18 (c) 12 (d) 3

2 If $3ak = 12a^2$, then $k =$ ....

(a) $4a^2$ (b) $3a$ (c) $4a$ (d) $3a^2$

3 If $X = \{1, 2\}$, $Y = \{3, 4\}$, then $(3, 4) \in$ ....

(a) $X \times Y$ (b) $Y \times X$ (c) X^2 (d) Y^2

4 If (a , 5) = (6 , b) , then a + b = ...

(a) 5 (b) 11 (c) 6 (d) 1

5 $\frac{\text{Sum of the values}}{\text{Their number}}$ = ...

(a) the range. (b) the standard deviation.

(c) the arithmetic mean. (d) the mode.

6 If the point (2 , y) lies on the X-axis , then y + 4 = ...

(a) 5 (b) 4 (c) 2 (d) 3

2 **[a]** If 4 a = 3 b , **then find the value of :** $\frac{4a+b}{2a-b}$

[b] If X = {0 , 3 , 4} , Y = {1 , 2 , 3 , 4 , 5} and R is a relation from X to Y where "a R b" means "a + b = 5" for all a ∈ X , b ∈ Y

1 Find the relation R

2 Represent the relation R by an arrow diagram.

3 Is R a function ?

3 **[a]** If X × Y = {(2 , 6) , (2 , 9) , (3 , 6) , (3 , 9)} , **find :**

1 X , Y 2 Y × Y

[b] Draw the curve of the function f : $f(X) = 1 + X^2$ at the interval [– 3 , 3] **and from the graph find :**

1 The coordinates of the vertex of the curve.

2 The equation of the axis of symmetry.

3 The minimum value.

4 **[a]** If X , y , z , r are proportional quantities , **then prove that :** $\frac{X^2 + 2z^2}{y^2 + 2r^2} = \frac{Xz}{yr}$

[b] From the data of the following table , answer the following questions :

1 Show the kind of variation between y and X

2 Find the constant proportion.

3 Find the value of y when $X = 3$

X	2	4	6
y	6	3	2

5 **[a]** If $f(X) = X^2 - 3X$, $g(X) = X - 3$

1 **Find :** $f(2) + g(2)$ 2 **Prove that :** $f(3) + g(3) = 0$

[b] Calculate the standard deviation for the values : 12 , 13 , 16 , 18 , 21



11 Port Said Governorate



Answer the following questions :

1 Choose the correct answer from those given :

1 If $(3, 5) \in \{3, 6\} \times \{X, 8\}$, then $X =$ ....

(a) 8 (b) 6 (c) 5 (d) 3

2 The linear function given by the rule $y = 2X - 1$ is represented graphically by a straight line intersecting the y-axis at the point ....

(a) $\left(\frac{1}{2}, 0\right)$ (b) $(0, -1)$ (c) $(-1, 0)$ (d) $\left(0, \frac{1}{2}\right)$

3 The difference between the greatest value and the smallest value in a set of individuals is called ....

(a) the standard deviation. (b) the arithmetic mean.

(c) the median. (d) the range.

4 If the point $(X - 4, 2 - X)$ where $X \in \mathbb{Z}$ is located in the fourth quadrant , then $X =$ ....

(a) 2 (b) 3 (c) 4 (d) 6

5 Which of the following tables represents the direct variation between X and y ?

(a)

X	y
2	9
4	18

(b)

X	y
3	20
5	12

(c)

X	y
3	6
−2	−9

(d)

X	y
10	9
5	18

6 If $(X - 1, 11) = (8, y + 3)$, then $\sqrt{X + 2y} =$ ....

(a) 5 (b) ± 5 (c) $\sqrt{17}$ (d) 25

2 **[a]** If $X = \{1, 2\}$, $Y = \{2, 5\}$, $Z = \{4, 5\}$, **then find :**

1 $n(X \times Z)$ 2 $(X - Y) \cap Z$

[b] Represent graphically $f : f(X) = X^2 + 2X + 1$, consider $X \in [-4, 2]$

From the graph deduce :

1 The coordinates of the vertex of the curve.

2 The minimum or the maximum value of the function.

3 **[a]** If $f(X) = 4X + b$ and $f(3) = 15$, **find the value of :** b

[b] If $y \propto \frac{1}{X}$ and $y = 6$ when $X = 2.5$, **find :**

1 The relation between X , y 2 The value of y when $X = 5$

4 **[a]** If X = {1 , 2 , 3} , Y = {12 , 21 , 47 , 52} and R is a relation from X to Y where "a R b" means "a is a digit from the digits of b" for each a ∈ X , b ∈ Y

1. Write R and represent it by an arrow diagram.
2. Which of the following relations is correct and why ? 1 R 52 , 2 R 21 , 3 R 47

[b] If 7 , x and $\frac{1}{y}$ are in continued proportion , **then find the value of :** $x^4 y^2$

5 **[a]** If $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$, **then prove that :** $\frac{2y - z}{3x - 2y + z} = \frac{1}{2}$

[b] Calculate the arithmetic mean and the standard deviation for the values :

3 , 6 , 7 , 9 , 15

12 Damietta Governorate



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from the given ones :**

1. $\sqrt{36}$ = ...
   (a) 6 (b) – 6 (c) ± 6 (d) 18
2. The point (– 2 , 5) lies in the .... quadrant.
   (a) first (b) second (c) third (d) fourth
3. The commonest measure of dispersions and the most accurate is ....
   (a) the median. (b) the arithmetic mean.
   (c) the mode. (d) the standard deviation.
4. $\mathbb{R}$ = ...
   (a) $\mathbb{Q} \cap \mathbb{Q}'$ (b) $\mathbb{R}_+ \cap \mathbb{R}_-$ (c) $\mathbb{R}_+ \cup \mathbb{R}_-$ (d) $\mathbb{Q} \cup \mathbb{Q}'$
5. If $(x - 3 , 2^y) = (2 , 32)$, then (x , y) = ...
   (a) (5 , 2) (b) (2 , 5) (c) (5 , 5) (d) (2 , 2)
6. If $x y = 8$, then y ∝ ....
   (a) $x - 8$ (b) $\frac{1}{x}$ (c) x (d) $x + 8$

2 **[a]** If X = {2 , 5} , Y = {1 , 2} , Z = {3} , **find :**

1. n (X × Y)
2. (X – Y) × Z
3. Y^2

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a - b}{a - c} = \frac{b}{b + c}$

3 **[a]** If $X = \{1, 3, 4, 5\}$, $Y = \{1, 2, 3, 4, 5, 6\}$ and R is a relation from X to Y where "a R b" means "a + b = 7" for all $a \in X$, $b \in Y$

1. Write R
2. Show giving reasons that R is a function and find its range.

[b] If $\frac{21 X - y}{7 X - z} = \frac{y}{z}$ **, then prove that :** $y \propto z$

4 **[a] Calculate the standard deviation for the values :** 12 , 13 , 16 , 18 , 21

[b] If $y \propto X$, $y = 6$ when $X = 3$ **, find :**

1. The relation between X , y
2. The value of y when $X = 5$

5 **[a]** If $\frac{X}{3} = \frac{y}{4} = \frac{z}{5}$ **, then prove that :** $\sqrt{3 X^2 + 3 y^2 + z^2} = 2 X + y$

[b] Represent graphically the function $f : f(X) = X^2 + 3$, $X \in [-2, 2]$

From the graph deduce :

1. The equation of symmetry line.
2. The minimum value of the function.

13 Kafr El-Sheikh Governorate



Answer the following questions : ***(Calculator is allowed)***

1 **[a] Choose the correct answer from the given ones :**

1. The third proportional of the numbers 4 , 12 , ... , 48 is ....
   (a) 7 (b) 32 (c) 16 (d) 36
2. $\varnothing$ .... $\{1, 2\}$
   (a) $\in$ (b) $\notin$ (c) $\not\subset$ (d) $\subset$
3. The range of the set of the values : 7 , 3 , 6 , 9 and 5 equals ....
   (a) 3 (b) 6 (c) 4 (d) 12

[b] Represent graphically the function $f : f(X) = (X - 2)^2$, where $X \in [-1, 5]$, then from the graph deduce the vertex of the curve , the equation of the symmetry axis and the minimum value of the function.

2 **[a] Choose the correct answer from the given ones :**

1. $(\sqrt{7} + \sqrt{5})(\sqrt{7} - \sqrt{5}) =$ ....
   (a) 2 (b) 12 (c) 35 (d) -2

2 $|-5|+|5| =$ ....

(a) zero (b) 25 (c) 10 (d) -10

3 If $(x-2, 3) = (5, x+y)$, then $x - y =$ ....

(a) 7 (b) 3 (c) -11 (d) 11

[b] If y is the middle proportional between x and z, **prove that :** $\frac{x-y}{x-z} = \frac{y}{y+z}$

3 **[a]** If $X = \{1, 3, 4, 5\}$, $Y = \{1, 2, 3, 4, 5\}$ and R is a relation from X to Y where "a R b" means "b = 6 – a" for all $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Show that R is a function and find its range.

[b] If $3x = 2y$, **find the value of the ratio :** $\frac{3x+2y}{6y-x}$

4 **[a]** If $X = \{2, -1\}$, $Y = \{4, 0\}$, $Z = \{4, 5, -2\}$, **find :**

1 $X \times Y$ 2 $(Y \cap Z) \times X$ 3 $n(Y^2)$

[b] If $f(x) = 2x + a$ and $f(2) = 1$, **find the value of :** a

5 **[a]** If y changes inversely with x^2 and $y = 2$ when $x = 4$

1 Find the relation between y and x

2 Deduce the value of y when $x = 16$

[b] **Calculate the arithmetic mean and the standard deviation of the set of values :** 8, 9, 7, 6 and 5

14 El-Beheira Governorate



Answer the following questions : ***(Calculator is permitted)***

1 **Choose the correct answer from the given ones :**

1 The solution set in $\mathbb{R}$ for the equation $x^2 + 9 = 0$ is ....

(a) $\{-3\}$ (b) $\{3\}$ (c) $\{-3, 3\}$ (d) $\varnothing$

2 If the point $(k-4, 2-k)$ where $k \in \mathbb{Z}$ is located in the third quadrant, then $k =$ ....

(a) 2 (b) 3 (c) 4 (d) 6

3 The multiplicative inverse of the number $\frac{\sqrt{3}}{6}$ is ....

(a) $-\frac{\sqrt{3}}{6}$ (b) $6\sqrt{3}$ (c) $2\sqrt{3}$ (d) $-2\sqrt{3}$

4 If 7 , x , $\frac{1}{y}$ are in continued proportion , then x^2 y = ...

(a) 7 (b) $\frac{1}{7}$ (c) 14 (d) 49

5 If a + 3 b = 7 , c = 3 , then the value of a + 3 (b + c) = ...

(a) 10 (b) 16 (c) 21 (d) 30

6 The difference between the greatest value and the smallest value in a set of values is called ....

(a) the arithmetic mean. (b) the median.

(c) the range. (d) the standard deviation.

2 [a] If X = {1} , Y = {2 , 3} , Z = {2 , 5 , 6} , **find :**

1 X × (Y ∩ Z) 2 n (Z^2)

[b] Find the positive number which if its square is added to each of the two terms of the ratio 5 : 11 , it becomes 3 : 5

3 [a] If the point (a , 3) is located on the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 4x - 5$, **find the value of :** a

[b] If $\frac{a+b}{3} = \frac{b+c}{6} = \frac{c+a}{5}$, **then prove that :** $\frac{a+b+c}{a} = 7$

4 [a] If X = {1 , 3 , 5} and R is a relation on X where "a R b" means "a + b = 6" for each a ∈ X , b ∈ X

1 Write R

2 Show that R is a function and find its range.

[b] **Calculate the standard deviation for the values :** 17 , 22 , 20 , 23 , 18

5 [a] If y ∝ x , y = 6 when x = 3 , **find :**

1 The relation between y , x

2 The value of y when x = 5

[b] Represent graphically the quadratic function f where $f(x) = x^2 - 3$, where $x \in [-3 , 3]$ **and from the graph deduce :**

1 The equation of the axis of symmetry.

2 The minimum value of the function.

15 El-Fayoum Governorate



Answer the following questions : *(Using calculators is allowed)*

1 **Choose the correct answer :**

1. The positive square root to the average of squares deviations of values from the mean is called the ....
   (a) median. (b) mode. (c) range. (d) standard deviation.

2. If $f(3X) = 6$, then $f(-2) =$ ....
   (a) -12 (b) -3 (c) 6 (d) -18

3. $[-5, 3] -]-5, 3[=$ ....
   (a) $\{-5, 3\}$ (b) $]-5, 3]$ (c) $[-5, 3[$ (d) $\varnothing$

4. The fifth of the number 5^{10} equals ....
   (a) 5^2 (b) 5^9 (c) 5^5 (d) 5^8

5. If $\frac{X}{2} = \frac{y}{3} = \frac{z}{5}$, then each ratio equals ....
   (a) $\frac{X + y + z}{30}$ (b) $\frac{X + 2y - z}{3}$ (c) $\frac{X - y + z}{10}$ (d) $\frac{X - y}{5}$

6. If X is an odd number , then the odd number of the following is ....
   (a) $X - 1$ (b) $X + 1$ (c) $X + 2$ (d) $X + 3$

2 **[a]** If $3a = 2b$, **then find the value of the ratio :** $\frac{3a - b}{a + 2b}$

[b] If $f(X) = aX + 5$ and $f(-3) = 8$, **then find the value of :** a

3 **[a]** If X , y , z are in continued proportion , **prove that :** $\frac{X^2 + y^2}{y^2 + z^2} = \frac{X}{z}$

[b] If $X = \{-1, 1, 2\}$, $Y = \{2, 4, 6, 8\}$ and R is a relation from X to Y where "a R b" means "b = 2 a + 4" for each $a \in X$, $b \in Y$, write R and represent it by an arrow diagram , show that R is a function from X to Y , why ?

4 **[a]** If $y \propto X$ and $y = 20$ when $X = 7$, then find the relation between X and y , then find the value of y when $X = 14$

[b] If $(5 - 2X, y^3) = (1, 27)$, **then find the value of :** $\sqrt{3X + y}$

5 **[a]** Represent graphically the function $f : f(X) = X^2 - 2$ where $X \in [-3, 3]$, and from the drawing deduce the coordinates of the vertex of the curve and the minimum value of the function.

[b] **Find the standard deviation of the values :** 7 , 16 , 13 , 5 , 9

16 Beni Suef Governorate



Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1. The point (– 4 , – 2) lies in the .... quadrant.
   (a) first (b) second (c) third (d) fourth

2. If x represents a negative number , then the positive number from the following is ....
   (a) $2x$ (b) $3x^2$ (c) $4x^3$ (d) $6x^5$

3. If $xy = 1$, then y varies with ....
   (a) $\frac{1}{x}$ (b) $x - 1$ (c) x (d) $x + 1$

4. The simplest and easiest method of measuring dispersion is ....
   (a) the median. (b) the mean.
   (c) the standard deviation. (d) the range.

5. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = k$ where $k \in \mathbb{R}$, then $\frac{a\,c\,e}{b\,d\,f} =$ ....
   (a) k^3 (b) k^2 (c) k (d) 3

6. If $3x = 2y$, then $\frac{2x}{3y} =$ ....
   (a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{9}{4}$ (d) $\frac{4}{9}$

2 **[a]** Find the number that if we add it to each term of the ratio 7 : 11 , it becomes 2 : 3

[b] If X = {1 , 2 , 3} , Y = {1 , 3 , 4 , 9} and R is a relation from X to Y where "a R b" means "$b = a^2$" for all a ∈ X , b ∈ Y , write R and represent it by an arrow diagram and show whether R is a function or not.

3 **[a]** If $\frac{x}{2} = \frac{y}{3} = \frac{z}{4} = \frac{3x - 2y + 5z}{5k}$, **find the numerical value of :** k

[b] Represent graphically the function $f : f(x) = 2 - x^2$, $x \in [-2, 2]$, from the graph deduce the vertex point of the curve and the maximum value of the function.

4 **[a]** If y varies directly with x and y = 3 when $x = 15$, find the relation between y and x , then find the value of x when y = 100

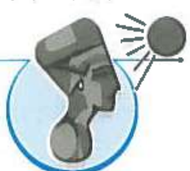
[b] If X = {1 , 2} , Y = {3 , 4 , 5} , **find :**

1. X × Y
2. Y × X
3. X^2

5 **[a]** If $f(x) = 3x + k$, $g(x) = k$ where f and g are polynomial functions , **find the value of k if :** $f(3) + g(5) = 15$

[b] Calculate the standard deviation of the set of values : 12 , 13 , 16 , 18 , 21

17 El-Menia Governorate



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from those given :**

1. $\sqrt{5} + \sqrt{20} =$ ....
   (a) $\sqrt{25}$ (b) $5\sqrt{5}$ (c) $9\sqrt{5}$ (d) $3\sqrt{5}$
2. If three times a number = 45 , then $\frac{1}{5}$ this number = ...
   (a) 15 (b) 5 (c) 3 (d) 9
3. $5^2 \times 5^{-2} =$ ....
   (a) 5 (b) 1 (c) zero (d) -5
4. If n (X) = 3 , n (X × Y) = 12 , then n (Y) = ...
   (a) 4 (b) 9 (c) 15 (d) 36
5. The relation which represents direct variation between the two variables x and y is ....
   (a) $xy = 5$ (b) $y = x + 3$ (c) $\frac{x}{3} = \frac{5}{y}$ (d) $\frac{x}{5} = \frac{y}{3}$
6. The range is the .... measure of dispersions.
   (a) simplest (b) greatest (c) difficult (d) otherwise

2 **[a]** If $X = \{1, 2, 3\}$, $Y = \{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{5}\}$ and R is a relation from X to Y where "a R b" means "a is the multiplicative inverse of b" for all a ∈ X , b ∈ Y , write R and represent it by an arrow diagram. Is R a function ? Why ?

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a+b}{a-c} = \frac{b}{b-c}$

3 **[a]** If $2y = 3x$, **find the value of :** $\frac{3x + 2y}{6y - x}$

[b] If $X = \{3, 4\}$, $Y = \{4, 5\}$, $Z = \{6, 5\}$, **find :**

1. $X \times (Y \cap Z)$
2. $(X - Y) \times Z$

4 **[a]** If $y \propto \frac{1}{x}$ and y = 3 when $x = 2$, **find :**

1. The relation between x and y
2. The value of x when y = 4

[b] Calculate the standard deviation for the values : 12 , 13 , 16 , 18 , 21

5 **[a]** Mention the degree of the function $f : f(x) = 3 - 2x^3$, **then find :** $f(0)$ and $f(-2)$

[b] Represent graphically the function $f : f(x) = x^2 + 2x + 1$, consider $x \in [-4 , 2]$ **and from the drawing deduce :**

1. The equation of the symmetry axis.
2. The maximum or the minimum value of the function.

18 Assiut Governorate



Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer :**

1. $x^5 + x^2 =$ .... (where $x \neq 0$)
   (a) x^7 (b) x^3 (c) x^{10} (d) x^5
2. If X = {1} , Y = {3} , then n (X × Y) = ...
   (a) {(1 , 3)} (b) {(3 , 1)} (c) 3 (d) 1
3. The multiplicative inverse of the number 0.25 is ....
   (a) 4 (b) – 0.25 (c) $\frac{1}{4}$ (d) – 0.5
4. The middle proportional between 4 , 16 is ....
   (a) – 8 (b) 8 (c) ± 8 (d) 64
5. 0.12 + 0.3 = ...
   (a) 0.42 (b) 0.15 (c) 0.24 (d) 0.36
6. The range of the set of the values : 4 , 14 , 25 and 34 equals ....
   (a) 4 (b) 30 (c) 38 (d) 34

2 **[a]** If X = {6 , 7} , Y = {3 , 7} , **find :**

1. (X ∩ Y) × X
2. $n(Y^2)$

[b] If $\frac{a}{2} = \frac{b}{3} = \frac{c}{4}$, **then prove that :** $\frac{3c - b}{a + b} = \frac{9}{5}$

3 **[a]** If X = {– 1 , 2 , 3} , Y = {1 , 4 , 6 , 9} and R is a relation from X to Y where "a R b" means "$a^2 = b$" for each of a ∈ X , b ∈ Y , write R and represent it by an arrow diagram and show that R is a function from X to Y and find its range.

[b] If $y \propto \frac{1}{x}$ and y = 3 when $x = 4$

1. Find the relation between y and x
2. Find the value of y when $x = \frac{3}{4}$

4 **[a]** Find the positive number which if its square is added to each of the two terms of the ratio 7 : 11 , it becomes 2 : 3

[b] Represent graphically the function $f : f(X) = X^2 - 4$, $X \in [-3, 3]$, from the graph deduce the vertex of the curve, the maximum value or the minimum value of the function and the equation of the axis of symmetry.

5 **[a]** If $f(X) = X^2 - 2$, $g(X) = 3$, **find :** $f\left(\sqrt{2}\right) + g(5)$

[b] Calculate the arithmetic mean and the standard deviation of the set of the values :
11 , 12 , 15 , 17 , 20

19 Souhag Governorate



Answer the following questions : ***(Calculators are allowed)***

1 **Choose the correct answer :**

1 $2^8 + 2^8 + 2^8 + 2^8 =$ ....

(a) 2^{32} (b) 8^8 (c) 2^{10} (d) 4^{12}

2 If n (X) = 2 , n (Y^2) = 9 , then n (X × Y) = ...

(a) 6 (b) 18 (c) 11 (d) 7

3 If $\sqrt{3}\, X - 1 = 2$ $(X \in \mathbb{R})$, then $X =$ ....

(a) 3 (b) $3\sqrt{3}$ (c) -3 (d) $\sqrt{3}$

4 If 8 , 6 , X , 12 are proportional quantities , then $X =$ ....

(a) 4 (b) 16 (c) 5 (d) 25

5 If the median of the values : a + 3 , a + 2 , a + 4 $(a \in \mathbb{Z}^+)$ is 8 , then a = ...

(a) 2 (b) 5 (c) 3 (d) 4

6 .... is a measure for dispersion.

(a) The median (b) The mode (c) The range (d) The mean

2 **[a]** If X × Y = {(1 , 1) , (1 , 3) , (1 , 5)}

, **find :** **1** X , Y **2** Y × X

[b] If $\frac{X}{y} = \frac{2}{3}$, **then find the value of :** $\frac{3X + 2y}{6y - X}$

3 **[a]** If X = {0 , 1 , 2 , 3} , Y = {2 , 3 , 4 , 5 , 6} , R is a relation from X to Y where "a R b" means "a + b = 5" for each a ∈ X , b ∈ Y

1 Write R and represent it by an arrow diagram.

2 Show that R is a function from X to Y and find its range.

[b] Find the number that if we add it to the two terms of the ratio 7 : 11 , the result will be 2 : 3

4 **[a]** If the straight line $y = 4X - 5$ passes through the point (a , 3) , **find the value of :** a

[b] If $y \propto X$ and $y = 6$ when $X = 3$, **find :**

1 The relation between X and y

2 The value of y when $X = 5$

5 **[a]** Represent graphically the function $f : f(X) = X^2 - 4X + 4 , X \in [-1 , 5]$

, **from the graph deduce :**

1 The vertex of the curve.

2 The equation of the axis of symmetry.

[b] Calculate the mean and the standard deviation of the values : 12 , 13 , 16 , 18 , 21

20 Qena Governorate



Answer the following questions : ***(Calculators are permitted)***

1 **Choose the correct answer :**

1 If $X y = 5$, then $y \propto$ ....

(a) X^{-1} (b) X (c) $5X$ (d) X^2

2 $\sqrt{3} + \sqrt{3} + \sqrt{3} =$ ....

(a) 3 (b) 9 (c) $3\sqrt{3}$ (d) 27

3 The middle proportional between 3 , 12 is ....

(a) 6 (b) – 6 (c) ± 6 (d) 9

4 The point (– 2 , 3) lies in the .... quadrant.

(a) first (b) second (c) third (d) fourth

5 All of the following are polynomial functions except ....

(a) $f_1(X) = X^3 + X^2 + 3$ (b) $f_2(X) = X^3 + \frac{1}{X} + 7$

(c) $f_3(X) = 5 - X^2$ (d) $f_4(X) = X^2 (X - 3)^2$

6 The range of the values : 51 , 24 , 43 , 55 , 28 is ....

(a) 55 (b) 24 (c) 21 (d) 31

2 **[a]** If X = {1 , 3 , 4 , 5} , Y = {1 , 2 , 3 , 4 , 5 , 6 , 7} and R is a relation from X to Y where "a R b" means "a + b = 7" , write R and represent it by an arrow diagram. Is R a function ? Why ? and if it's a function , find its range.

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

3 **[a]** If $f(X) = X^2 - 3X$, $g(X) = X - 3$

1 **Find :** $f(\sqrt{2}) + 3g(\sqrt{2})$

2 **Prove that :** $f(3) = g(3)$

[b] Find the number which if added to each of the two terms of the ratio 7 : 11 , it becomes 2 : 3

4 [a] If 5 a = 3 b , **find :** $\frac{7a+9b}{4a+2b}$

[b] **The following table shows the frequency distribution for the ages of 10 students :**

Ages in years	5	8	9	10	12	Total
Number of students	1	2	3	3	1	10

Calculate the standard deviation to age in years.

5 [a] If $y \propto x$ and y = 40 when x = 14 , find x when y = 80

[b] Represent graphically $f : f(x) = 2x^2 - 3$, $x \in [-2 , 2]$ **From the graph find :**

1 The vertex of the curve.

2 The equation of the axis of symmetry.

3 The maximum or minimum value of the function.

21 Luxor Governorate



Answer the following questions :

1 **Choose the correct answer :**

1 The sum of the factors of the number 15 equals ....

(a) 3 (b) 4 (c) 15 (d) 24

2 If $f(x) = 4x + a$ and $f(2) = 15$, then a = ...

(a) 2 (b) 4 (c) 7 (d) 15

3 The smallest expression in value when x = 7 is ....

(a) $\frac{6}{x}$ (b) $\frac{6}{x+1}$ (c) $\frac{6}{x-1}$ (d) $\frac{x}{6}$

4 The third proportional of the two numbers – 6 , 12 is ....

(a) – 24 (b) 6 (c) 18 (d) 72

5 If $3x - 1 = 1 - 3x$, then x = ...

(a) zero (b) $\frac{1}{3}$ (c) – 1 (d) 3

6 Which of the following values for the number x makes the range of the values x , 15 , 20 , 24 equal 14 ?

(a) 30 (b) 25 (c) 19 (d) 10

2 [a] If $f = \{(1 , 3) , (2 , 5) , (3 , 7) , (4 , 9) , (5 , 11)\}$, **write :**

1 The domain of f 2 The range of f 3 The rule of f

[b] Two integers , the ratio between them is 2 : 3 , if 7 is subtracted from each of them, the ratio becomes 1 : 2 Find the two numbers.

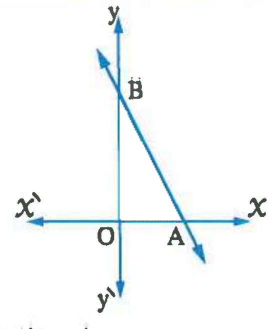
3 **[a]** If $X = \{-2, 2, 5\}$, $Y = \{3, 7, \ell\}$ and R is a function from X to Y where "a R b" means "$b = a^2 - 1$" for each $a \in X$, $b \in Y$

1. Find the value of ℓ
2. Write R
3. Represent the function by an arrow diagram.

[b] If $y = a - 9$, $y \propto \frac{1}{x^2}$ and $a = 18$ when $x = \frac{2}{3}$, find the relation between x , y and find the value of y when $x = 1$

4 **[a]** The opposite figure represents the function f where $f(x) = 4 - 2x$

Find the coordinates of A , B and the area of Δ AOB



[b] If $\frac{x}{7} = \frac{y}{3}$, **prove that :** $(2x - 3y)$, $(x + 2y)$, 10 , 26 are proportional.

5 **[a] Calculate the standard deviation of the values :** 72 , 53 , 61 , 70 , 59

[b] Graph the function $f : f(x) = 1 - 4x + x^2$ where $x \in [0, 4]$ **and from the graph find :**

1. The vertex of the curve.
2. The equation of the axis of symmetry.
3. The maximum or the minimum value of the function.

22 Aswan Governorate

Answer the following questions : ***(Calculator is allowed)***

1 **Choose the correct answer :**

1. If $X = \{1, 2\}$, $Y = \{0\}$, then $n(X \times Y) = ...$
   (a) 0 (b) 1 (c) 2 (d) 3
2. $(\sqrt{5} - 2)(\sqrt{5} + 2) = ...$
   (a) 5 (b) 3 (c) 2 (d) 1
3. The range of the set of the values : 16 , 32 , 5 , 27 and 20 is ....
   (a) 27 (b) 20 (c) 16 (d) 13
4. The third proportional for the numbers 8 , 6 , ... and 12 is ....
   (a) 24 (b) 20 (c) 16 (d) 8

5 If $x = 3$, $y = 5$, then $y^x =$ ....

(a) 135 (b) 125 (c) 115 (d) 95

6 If $5x = 12$, then $10x =$ ....

(a) 12 (b) 22 (c) 24 (d) 34

2 [a] If $X \times Y = \{(2, 2), (2, 5), (2, 7)\}$

, **find :** 1 Y 2 $Y \times X$

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a-b}{a-c} = \frac{b}{b+c}$

3 [a] If $X = \{2, 3, 5\}$, $Y = \{4, 6, 8, 10\}$ and R is a relation from X to Y where "a R b" means "2 a = b" for each $a \in X$, $b \in Y$

1 Write R and represent it by an arrow diagram.

2 Is R a function ?

[b] If y varies inversely as x and $y = 2$ when $x = 4$

, find the relation between y and x , then find the value of y when $x = 16$

4 [a] If the point (a , 3) is located on the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 4x - 5$, **find the value of :** a

[b] If $\frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3x}$, **find the value of :** x

5 [a] Represent graphically the function $f : f(x) = (x-3)^2$, taking $x \in [0, 6]$ and from the graph deduce the coordinates of the vertex point of the curve , the maximum or minimum value of the function and the equation of the axis of symmetry.

[b] The following frequency distribution shows the number of children of some families in a new city :

Number of children	Zero	1	2	3	4
Number of families	8	16	50	20	6

Calculate the mean and the standard deviation of the number of children.

23 New Valley Governorate



Answer the following questions : *(Calculator is allowed)*

1 **Choose the correct answer from those given :**

1. If $\sqrt[3]{X} = \sqrt{16}$, then $X =$ ....
   (a) 4 (b) 8 (c) 16 (d) 64
2. If 2 , X , 4 and 6 are proportional , then $X =$ ....
   (a) 1 (b) 3 (c) 5 (d) 8
3. If $y = 2X$, then $y \propto$ ....
   (a) $\frac{1}{X}$ (b) X (c) $X + 2$ (d) $X - 2$
4. $2^{X-5} = 1$ where $X \in$ ....
   (a) 5 (b) $\mathbb{R} - \{5\}$ (c) $\mathbb{R}$ (d) $\{5\}$
5. The middle proportional between 3 and $\frac{1}{3}$ is ....
   (a) ± 1 (b) 9 (c) $\frac{1}{9}$ (d) ± 9
6. If $\Sigma (X - \overline{X})^2 = 36$ for a set of values whose number equals 9 , then the standard deviation = ...
   (a) 2 (b) 3 (c) 4 (d) 6

2 **[a]** If $X = \{2 , 3\}$, $Y = \{3 , 4 , 5\}$, **then find :**

1. $X \times Y$ and represent it by an arrow diagram.
2. $n (X \times Y)$

[b] If $X^2 y^2 - 14 X y + 49 = 0$, **then prove that :** $y \propto \frac{1}{X}$

3 **[a]** Find the negative number which if its square is added to each of the two terms of the ratio 7 : 11 , it becomes 4 : 5

[b] If $X = \{2 , 4 , 8\}$ and R is a relation on X where "a R b" means "a is double b" for each $a \in X$, $b \in X$, write R Is R a function ? and why ?

4 **[a]** If $\frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - 5b + 3c}{X}$, **then find the value of each of :**

1. X
2. $\frac{a + b + c}{b}$

[b] If the function $f : \mathbb{R} \longrightarrow \mathbb{R}$, $f(X) = 2X - 3$, **then find the value of k if :**

1. $f(k) = 5$
2. $(2 , k) \in f$

5 **[a]** **The following frequency distribution shows the numbers of children of some families in a new city :**

Number of children (X)	3	5	7	9	11
Number of families (k)	3	12	21	10	4

Calculate the mean and the standard deviation to the number of children.

[b] Represent graphically the curve of the function f where $f(X) = (X + 1)^2$, $X \in [-3 , 1]$ **and from the drawing deduce :**

1. The coordinates of the vertex of the curve.
2. The equation of the symmetry axis.
3. The minimum value of the function.



South Sinai Governorate



Answer the following questions :

1 **Choose the correct answer :**

1. The degree of the polynomial function $f : f(X) = X^4 - 2X^2 + 5$ is ....
   (a) fourth. (b) third. (c) second. (d) first.
2. The fourth proportional of 3 , 6 , 6 is ....
   (a) 9 (b) 12 (c) 6 (d) 1
3. If n (X) = 5 and n (X × Y) = 15 , then n (Y) = ...
   (a) 20 (b) 10 (c) 3 (d) 2
4. The arithmetic mean of the values : 3 , 4 , 6 , 7 equals ....
   (a) 40 (b) 20 (c) 10 (d) 5
5. If $y^2 + 4X^2 = 4Xy$, then ....
   (a) $y \propto X$ (b) $y \propto X^2$ (c) $y \propto \frac{1}{X}$ (d) $y \propto \frac{1}{X^2}$
6. If X is an odd number , then the next odd number is ....
   (a) X^2 (b) $X^2 + X$ (c) $X + 6$ (d) $X + 2$

2 If X = {2 , 3 , 4} and Y = {y : y ∈ ℕ , 2 ≤ y < 9} where ℕ is the set of natural numbers and R is a relation from X to Y where "a R b" means "$a = \frac{1}{2}$ b" , a ∈ X and b ∈ Y , write R
Is R a function from X to Y ? Then find the range.

3 **[a]** Find the number which if we added it to each of the two terms of the ratio 7 : 11 , it becomes 2 : 3

[b] If $y \propto x$ and $y = 14$ when $x = 42$, find the relation between x and y , then find the value of y when $x = 60$

4 **[a]** Represent graphically the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 2x - 3$

[b] If b is the middle proportional between a and c , prove that : $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

5 **[a]** If $(x^3 , y + 1) = \left(27 , \sqrt[3]{125}\right)$, find the value of each of : x and y

[b] Calculate the arithmetic mean and the standard deviation for the values :
20 , 17 , 22 , 23 , 18

25 North Sinai Governorate



Answer the following questions :

1 **Choose the correct answer from those given :**

1. If $f(x) = 5$, then $f(5) + f(-5) =$ ....
   (a) zero (b) 5 (c) -5 (d) 10
2. If $(x - 2 , 3) = (5 , 3)$, then $x =$ ....
   (a) 5 (b) 3 (c) 7 (d) 8
3. If f is an odd number , then the next odd number is ....
   (a) f^2 (b) $f + 6$ (c) $f + 2$ (d) $f^2 + 1$
4. The fourth proportional of the quantities 4 , 8 , 8 equals ....
   (a) 4 (b) 8 (c) 12 (d) 16
5. The sum of the two square roots of $2\frac{1}{4}$ equals ....
   (a) $1\frac{1}{2}$ (b) zero (c) $\frac{1}{2}$ (d) $\sqrt{2}$
6. The difference between the greatest value and the smallest value of a set of individuals is called ....
   (a) the range. (b) the arithmetic mean.
   (c) the median. (d) the standard deviation.

2 **[a]** If $X = \{1 , 2 , 3\}$, $Y = \left\{1 , \frac{1}{2} , \frac{1}{3} , \frac{1}{5}\right\}$ and R is a relation from X to Y where "a R b" means "a is the multiplicative inverse of b" for all $a \in X$, $b \in Y$, write R and represent it by an arrow diagram. Is R a function or not ?

[b] If $y \propto \frac{1}{x}$ and $y = 3$ when $x = 2$

1. Find the relation between x and y
2. Find the value of y when $x = 1.5$

3 **[a]** If $f(X) = 5X + 4$ is represented graphically by a straight line passing through the point $(3, b)$, **then find the value of :** b

[b] If $\frac{X}{y} = \frac{3}{4}$, **find the value of :** $\frac{3X + y}{X + 5y}$

4 **[a]** If $X \times Y = \{(1, 2), (4, 2), (5, 2)\}$, **then find :** X , Y , Y^2

[b] If b is the middle proportional between a and c , **prove that :** $\frac{5c^2 - 2b^2}{5b^2 - 2a^2} = \frac{c}{a}$

5 **[a] Calculate the standard deviation to the following data :** 12 , 13 , 16 , 18 and 21

[b] Represent graphically the function $f : f(X) = 2 - X^2$, $X \in [-3, 3]$

From the graph deduce :

1 The coordinates of the vertex point of the curve.

2 The equation of the axis of symmetry.

3 The maximum or minimum value of the function.

26 Red Sea Governorate



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from those given :**

1 If the point $(a - 3, 5)$ lies on y-axis , then a = ...

(a) 5 (b) 3 (c) 2 (d) 0

2 If 2 , 3 , 6 , X are proportional quantities , then X = ...

(a) 9 (b) 18 (c) 12 (d) 3

3 The range of the set of the values : 3 , 5 , 6 , 7 , 9 equals ....

(a) 3 (b) 4 (c) 6 (d) 12

4 If $f(X) = 3$, then $f(5) + f(-5)$ = ...

(a) -1 (b) 0 (c) 1 (d) 6

5 If $X - y = 5$, $X + y = 1$, then $X^2 - y^2$ = ...

(a) $\frac{1}{25}$ (b) 1 (c) 5 (d) 25

6 If $X y = 7$, then $y \propto$ ....

(a) $\frac{1}{X}$ (b) $X - 7$ (c) $X + 7$ (d) X

2 **[a]** If $X \times Y = \{(1, 1), (1, 5), (1, 7)\}$, **find :**

1 X 2 n (Y) 3 $Y \times X$

[b] If b is the middle proportional between a and c , **prove that :** $\frac{a^2 + b^2}{b^2 + c^2} = \frac{a}{c}$

3 [a] If $f(x) = 4x + a$, $f(2) = 15$, **find the value of :** a

[b] If X = {1 , 2 , 3} , Y = {1 , 2 , 3 , 4 , 5} and R is a relation from X to Y where "a R b" means "a + b = 5" for each a ∈ X , b ∈ Y

1. Write R and represent it by a Cartesian diagram.
2. Is R a function or not ?

4 [a] If $\frac{x}{y} = \frac{2}{3}$, **find the value of :** $\frac{3x + 2y}{6y - x}$

[b] If $y \propto x$ and y = 2 when $x = 6$, **find :**

1. The relation between y and x
2. The value of y when $x = 15$

5 [a] Represent graphically the curve of the function f where $f(x) = 4 - x^2$ and $x \in [-3 , 3]$, **from the graph deduce :**

1. The coordinates of the vertex of the curve.
2. The equation of the axis of symmetry of the curve.

[b] **Find the standard deviation for the values :** 12 , 13 , 16 , 18 , 26

27 Matrouh Governorate



Answer the following questions : *(Calculators are allowed)*

1 **Choose the correct answer from those given :**

1. If a , b , 2 and 3 are proportional , then $\frac{a}{b}$ = ...
   (a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{3}{4}$ (d) $\frac{4}{3}$
2. [1 , 4] –]1 , 4[= ....
   (a) {0} (b) {1 , 4} (c) [1 , 4[(d) ∅
3. If (2 , 5) ∈ {3 , 2} × {1 , x} , then x = ...
   (a) 2 (b) 3 (c) 1 (d) 5
4. If $(x - 1 , 2^y) = (1 , 8)$, then (x , y) = ...
   (a) (2 , 3) (b) (3 , 2) (c) (0 , 3) (d) (0 , – 3)
5. The point (3 , – 4) lies in the .... quadrant.
   (a) first (b) second (c) third (d) fourth
6. If $\Sigma (x - \overline{x})^2 = 36$ for a set of values whose number is 9 , then σ = ...
   (a) 2 (b) 4 (c) 18 (d) 27

2 [a] If $X = \{1, 2, 3\}$, $Y = \{1, 3, 6, 9, 12\}$ and R is a relation from X to Y where "a R b" means "$a = \frac{1}{3}$ b" for all $a \in X$, $b \in Y$, write R and show whether it is a function or not, and if it is a function , write the range.

[b] If $\frac{a}{b} = \frac{2}{5}$, **find the value of :** $\frac{2a - 2b}{3a + 2b}$

3 [a] If $X \times Y = \{(1, 1), (1, 3), (1, 5)\}$

, **find :** 1 X , Y   2 Y^2

[b] If $\frac{x}{2a + b} = \frac{y}{2b - c} = \frac{z}{2c - a}$, **prove that :** $\frac{2x + y}{4a + 4b - c} = \frac{2x + 2y + z}{3a + 6b}$

4 [a] If the point (a , 3) is located on the straight line which represents the function $f : \mathbb{R} \longrightarrow \mathbb{R}$ where $f(x) = 4x - 5$, **find the value of :** a

[b] **The following frequency distribution shows the number of children of some families in a new city :**

Number of children	Zero	1	2	3	4
Number of families	8	16	50	20	6

Calculate the mean and the standard deviation to the number of children.

5 [a] If y varies inversely as x and $y = 10$ when $x = 3$, find the relation between x and y , then find the value of y when $x = 5$

[b] Represent graphically the function $f : f(x) = (x - 3)^2$, $x \in [0, 6]$
From the graph deduce the vertex of the curve , the maximum or minimum value of the function.

Answers of model examinations of the school book of algebra & statistics

Model 1

1

1 b   2 c   3 b   4 a   5 c   6 b

2

[a] 1 $Y = \{2 , 5 , 7\}$

2 $Y \times X = \{(2 , 2) , (5 , 2) , (7 , 2)\}$

[b] Let $\frac{a}{b} = \frac{c}{d} = m$, where $m > 0$

$\therefore a = b\,m , c = d\,m$

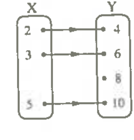
$\therefore$ L.H.S. $= \frac{a}{b - a} = \frac{b\,m}{b - b\,m} = \frac{b\,m}{b(1 - m)} = \frac{m}{1 - m}$ (1)

, R.H.S. $= \frac{c}{d - c} = \frac{d\,m}{d - d\,m} = \frac{d\,m}{d(1 - m)} = \frac{m}{1 - m}$ (2)

From (1) , (2) : $\therefore \frac{a}{b - a} = \frac{c}{d - c}$

3

[a] 1 $R = \{(2 , 4) , (3 , 6) , (5 , 10)\}$



2 R is a function because every element of X has only one image in Y

[b] Let the number be x

$\therefore \frac{x + 7}{x + 11} = \frac{2}{3}$

$\therefore 3x + 21 = 2x + 22$ $\therefore x = 1$

$\therefore$ The required number is 1

4

[a] 1 The range $= \{3 , 1 , 5\}$

2 $a + b = 8$

[b] 1 $\because y \propto \frac{1}{x}$ $\therefore x\,y = m$

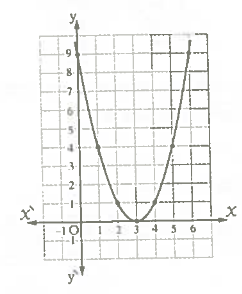
$\therefore m = 2 \times 3 = 6$ $\therefore x\,y = 6$

2 At $x = 1.5$ $\therefore y = \frac{6}{1.5} = 4$

5

[a] $f(x) = (x - 3)^2$

x	0	1	2	3	4	5	6
$f(x)$	9	4	1	0	1	4	9



From the graph :

The vertex of the curve is (3 , 0)

, the minimum value = 0

, the equation of the axis of symmetry is : $x = 3$

[b] Form the table by yourself

, then the arithmetic mean = 7

, the standard deviation $\simeq 1.41$

Model 2

1

1 a   2 c   3 d   4 b   5 c   6 a

2

[a] 1 $n(X \times Z) = 2$

2 $(Y \cap X) \times Z = \{2\} \times \{3\} = \{(2 , 3)\}$

[b] $\because$ b is the middle proportional between a and c

$\therefore \frac{a}{b} = \frac{b}{c} = m$ $\therefore b = c\,m , a = c\,m^2$

$\therefore$ L.H.S. $= \frac{a - b}{a - c} = \frac{c\,m^2 - c\,m}{c\,m^2 - c} = \frac{c\,m(m - 1)}{c(m^2 - 1)}$

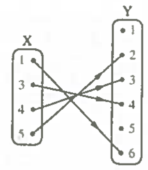
$= \frac{c\,m(m - 1)}{c(m - 1)(m + 1)} = \frac{m}{m + 1}$ (1)

, R.H.S. $= \frac{b}{b + c} = \frac{c\,m}{c\,m + c} = \frac{c\,m}{c(m + 1)} = \frac{m}{m + 1}$ (2)

From (1) , (2) : $\therefore \frac{a - b}{a - c} = \frac{b}{b + c}$



[a] 1 $R = \{(1, 6), (3, 4), (4, 3), (5, 2)\}$



2 R is a function because every element of X has only one image in Y

[b] $\because 5a = 3b \qquad \therefore \frac{a}{b} = \frac{3}{5}$

$\therefore a = 3m, b = 5m$

$\therefore \frac{7a + 9b}{4a + 2b} = \frac{7 \times 3m + 9 \times 5m}{4 \times 3m + 2 \times 5m} = \frac{66m}{22m} = 3$

4

[a] $\because f(X) = 4X + b, f(3) = 15$

$\therefore 4 \times 3 + b = 15 \qquad \therefore b = 3$

[b] 1 $\because y \propto X \qquad \therefore y = mX$

$\therefore 6 = m \times 3 \qquad \therefore m = 2$

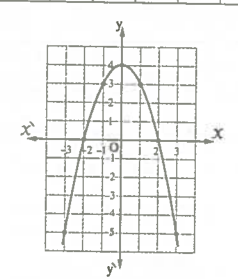
$\therefore y = 2X$

2 At $X = 5 \qquad \therefore y = 2 \times 5 = 10$



[a] $f(X) = 4 - X^2$

X	−3	−2	−1	0	1	2	3
$f(X)$	−5	0	3	4	3	0	−5



From the graph : The vertex of the curve is (0 , 4)

, the maximum value = 4

, the equation of the axis of symmetry is : $X = 0$

[b] Form the table by yourself

, then the mean = 2.26

, the standard deviation ≃ 1.06

Answers of model for the merge students

1

1 the first	2 the third	3 30
4 X	5 9	6 9

2

1 a	2 a	3 d
4 b	5 c	6 c

3

1 ✔	2 ✘	3 ✘
4 ✔	5 ✔	6 ✔

4

1 1	2 6	3 8
4 10	5 ± 6	6 2

Answers of governorates' examinations of algebra & statistics



1 Cairo

1

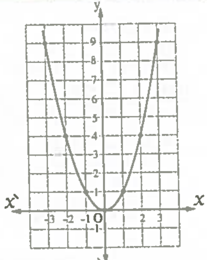


1 c 2 a 3 b 4 d 5 a 6 d

2

[a] $f(x) = x^2$

x	−3	−2	−1	0	1	2	3
$f(x)$	9	4	1	0	1	4	9



From the graph :

1 The minimum value = 0

2 The equation of the axis of symmetry is : $x = 0$

[b] Form the table by yourself , then $\sigma \simeq 3.22$

3

[a] 1 $X \times Y = \{(3, 4), (3, 5), (4, 4), (4, 5)\}$

2 $\because X - Y = \{3\}$

$\therefore (X - Y) \times Z = \{3\} \times \{5, 6\} = \{(3, 5), (3, 6)\}$

[b] $\because \frac{x}{y} = \frac{z}{l} = m$

$\therefore x = ym \quad , \quad z = lm$

$\therefore \frac{y - x}{x} = \frac{y - ym}{ym} = \frac{y(1 - m)}{ym} = \frac{1 - m}{m}$ (1)

$, \frac{l - z}{z} = \frac{l - lm}{lm} = \frac{l(1 - m)}{lm} = \frac{1 - m}{m}$ (2)

From (1) , (2) : $\therefore \frac{y - x}{x} = \frac{l - z}{z}$

4

[a] Let the number be x

$\therefore \frac{3 + x}{5 + x} = \frac{1}{2}$ $\therefore 6 + 2x = 5 + x$

$\therefore x = -1$

$\therefore$ The number is −1

[b] 1 $R = \{(1, 1), (2, 1), (3, 1)\}$

2 R is a function , its range = $\{1\}$

5

[a] 1 $\because y \propto x$ $\therefore y = mx$

$\therefore 20 = 4m$ $\therefore m = 5$ $\therefore y = 5x$

2 At $y = 40$ $\therefore 40 = 5x$ $\therefore x = 8$

[b] $\because f(5) = 13$ $\therefore 13 = 2 \times 5 + k$

$\therefore 13 = 10 + k$ $\therefore k = 3$

2 Giza

1

1 d 2 c 3 c 4 d 5 a 6 c

2

[a] 1 $n(X \times Z) = 2$

2 $\because Y \cap X = \{2\}$

$\therefore (Y \cap X) \times Z = \{2\} \times \{3\} = \{(2, 3)\}$

[b] $\because f(2) = 10$ $\therefore 10 = 2 \times 4 + b$

$\therefore 10 = 8 + b$ $\therefore b = 2$

3

[a] $R = \{(2, 4), (3, 6), (5, 10)\}$

R is a function because every element in X has only one image in Y



[b] Let the number be x

$\therefore \frac{7 + x}{11 + x} = \frac{2}{3}$ $\therefore 21 + 3x = 22 + 2x$

$\therefore x = 1$ $\therefore$ The number is 1

4

[a] $\because 2a = 3b = 3c$ $\therefore 2a = 3b$

$\therefore a = \frac{3}{2} b$

$, 3b = 3c$ $\therefore b = c$

$\therefore a : b : c = \frac{3}{2} b : b : b$ (multiplying by 2)

$\therefore a : b : c = 3b : 2b : 2b$

$\therefore a : b : c = 3 : 2 : 2$

$\therefore a = 3m \quad , \quad b = 2m \quad , \quad c = 2m$

$\therefore \frac{6a + b + c}{4a + 6b + 6c} = \frac{18m + 2m + 2m}{12m + 12m + 12m} = \frac{22m}{36m} = \frac{11}{18}$

[b] Form the table by yourself , then $\sigma \simeq 1.41$



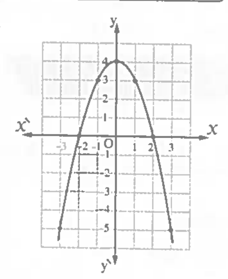
[a] 1 $\because y \propto x$ $\quad \therefore y = m x$

$\therefore 6 = 3 m$ $\quad \therefore m = 2$ $\quad \therefore y = 2 x$

2 At $x = 4$ $\quad \therefore y = 2 \times 4$ $\quad \therefore y = 8$

[b] $f(x) = 4 - x^2$

x	−3	−2	−1	0	1	2	3
$f(x)$	−5	0	3	4	3	0	−5



From the graph :

* The vertex of the curve is : (0 , 4)
* The equation of the symmetry axis is : $x = 0$



Alexandria



1 c 2 a 3 b 4 c 5 d 6 c

2

[a] f is of the first degree

$, f(-2) = 3 \times -2 = -6$

$, f\left(\sqrt{3}\right) = 3 \times \sqrt{3} = 3\sqrt{3}$

[b] $\because 5 a = 3 b$ $\quad \therefore \frac{a}{b} = \frac{3}{5}$

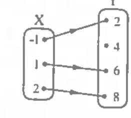
$\therefore a = 3 m \quad , \quad b = 5 m$

$\therefore \frac{7 a + 9 b}{4 a + 2 b} = \frac{21 m + 45 m}{12 m + 10 m} = \frac{66 m}{22 m} = \frac{3}{2}$



[a] $R = \{(-1 , 2) , (1 , 6) , (2 , 8)\}$

R is a function because every element in X has only one image in Y



[b] $\because x^4 y^2 - 14 x^2 y + 49 = 0$

$\therefore (x^2 y - 7)^2 = 0$ $\quad \therefore x^2 y - 7 = 0$

$\therefore x^2 y = 7$ $\quad \therefore y \propto \frac{1}{x^2}$



[a] $\because (x - 2 , 3) = (5 , y + 1)$

$\therefore x - 2 = 5$ $\quad \therefore x = 7$

$, y + 1 = 3$ $\quad \therefore y = 2$

[b] Form the tables by yourself , then the $\overline{X} = 2$ children , $\sigma \simeq 1$ children.

5

[a] $\because \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = m$

$\therefore c = d m \quad , \quad b = d m^2 \quad , \quad a = d m^3$

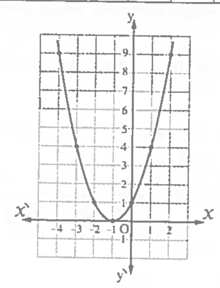
$\therefore \frac{a}{b + d} = \frac{d m^3}{d m^2 + d} = \frac{d m^3}{d (m^2 + 1)} = \frac{m^3}{m^2 + 1}$ (1)

$, \frac{c^3}{c^2 d + d^3} = \frac{d^3 m^3}{d^3 m^2 + d^3} = \frac{d^3 m^3}{d^3 (m^2 + 1)} = \frac{m^3}{m^2 + 1}$ (2)

From (1) , (2) : $\therefore \frac{a}{b + d} = \frac{c^3}{c^2 d + d^3}$

[b] $f(x) = x^2 + 2 x + 1$

x	−4	−3	−2	−1	0	1	2
$f(x)$	9	4	1	0	1	4	9



From the graph :

1 The vertex of the curve is : (− 1 , 0)

2 The equation of the symmetry axis is : $x = -1$

3 The minimum value = 0

4 El-Kalyoubia

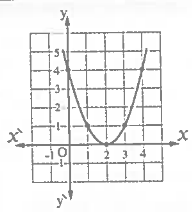


1 d 2 c 3 d 4 a 5 a 6 a

2

[a] $f(X) = (X-2)^2$

X	0	1	2	3	4
$f(X)$	4	1	0	1	4



From the graph :

1 The equation of the symmetry axis is : $X = 2$

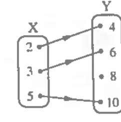
2 The minimum value $= 0$

[b] $\because y \propto \frac{1}{X}$ $\qquad \therefore \frac{y_1}{y_2} = \frac{X_2}{X_1}$

$\therefore \frac{\frac{4}{7}}{y_2} = \frac{3\frac{1}{5}}{2\frac{4}{5}}$ $\qquad \therefore y_2 = \frac{\frac{4}{7} \times 2\frac{4}{5}}{3\frac{1}{5}} = \frac{1}{2}$

3

[a] 1 $R = \{(2, 4), (3, 6), (5, 10)\}$



2 Yes , R is a function.

[b] $\because \frac{a}{b} = \frac{c}{d} = m$ $\qquad \therefore a = b\,m \; , \; c = d\,m$

$\therefore \sqrt[3]{\frac{5a^3 - 3c^3}{5b^3 - 3d^3}} = \sqrt[3]{\frac{5b^3m^3 - 3d^3m^3}{5b^3 - 3d^3}}$

$= \sqrt[3]{\frac{m^3(5b^3 - 3d^3)}{5b^3 - 3d^3}}$

$= \sqrt[3]{m^3} = m$ $\qquad$ (1)

$, \frac{a+c}{b+d} = \frac{bm + dm}{b+d} = \frac{m(b+d)}{b+d} = m$ $\qquad$ (2)

From (1) , (2) : $\therefore \sqrt[3]{\frac{5a^3 - 3c^3}{5b^3 - 3d^3}} = \frac{a+c}{b+d}$

4

[a] 1 $\because Z - Y = \{5, -2\}$, $X \cap Y = \{4\}$

$\therefore (Z - Y) \times (X \cap Y) = \{5, -2\} \times \{4\}$

$= \{(5, 4), (-2, 4)\}$

2 $n(X^2) = 2 \times 2 = 4$

[b] $\because f(3) = 15$ $\qquad \therefore 15 = 4 \times 3 + b$

$\therefore 15 = 12 + b$ $\qquad \therefore b = 3$

5

[a] $\because \frac{a}{2X + y} = \frac{b}{3y - X} = \frac{c}{4X + 5y}$

Multiplying the terms of the 2nd ratio by 2 and adding the antecedents and consequents of the 1st and 2nd ratios

$\therefore \frac{a + 2b}{2X + y + 6y - 2X} = \frac{a + 2b}{7y}$

= one of the given ratios (1)

Multiplying the terms of the 2nd ratio by 4 and adding the antecedents and consequents of the 2nd and 3rd ratios

$\therefore \frac{4b + c}{12y - 4X + 4X + 5y}$

$= \frac{4b + c}{17y}$ = one of the given ratios $\qquad$ (2)

From (1) and (2) :

$\therefore \frac{a + 2b}{7y} = \frac{4b + c}{17y}$ $\qquad \therefore \frac{a + 2b}{7} = \frac{4b + c}{17}$

[b] Form the tables by yourself , then $\sigma \simeq 1.43$

5 El-Sharkia

1

1 b $\quad$ 2 c $\quad$ 3 d $\quad$ 4 a $\quad$ 5 d $\quad$ 6 c



2

[a] 1 $X - Y = \{1, 2\}$

2 $\because Y \cap X = \{3\}$

$\therefore (Y \cap X) \times Y = \{3\} \times \{3, 4\}$

$= \{(3, 3), (3, 4)\}$

3 $n(Y^2) = 2 \times 2 = 4$

[b] $\because \frac{a}{b} = \frac{b}{c} = \frac{c}{d} = m$

$\therefore c = d\,m \; , \; b = d\,m^2 \; , \; a = d\,m^3$

$\therefore \frac{b + d}{c^2 d + d^3} = \frac{d\,m^2 + d}{d^3 m^2 + d^3} = \frac{d(m^2 + 1)}{d^3(m^2 + 1)} = \frac{1}{d^2}$ $\qquad$ (1)

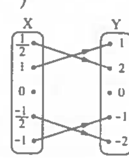
$, \frac{a}{c^3} = \frac{d\,m^3}{d^3 m^3} = \frac{1}{d^2}$ $\qquad$ (2)

From (1) , (2) : $\therefore \frac{b + d}{c^2 d + d^3} = \frac{a}{c^3}$

3

[a] $R = \left\{\left(\frac{1}{2}, 2\right), (1, 1), \left(\frac{-1}{2}, -2\right), (-1, -1)\right\}$

R is not a function because the element $0 \in X$ has no image in Y



[b] 1 $\because y \propto \frac{1}{x^2}$ $\therefore x^2 y = m$

$\therefore \left(\frac{2}{3}\right)^2 \times 9 = m$ $\therefore \frac{4}{9} \times 9 = m$

$\therefore m = 4$ $\therefore x^2 y = 4$

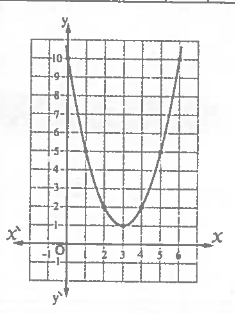
2 At $x = \frac{1}{2}$, $\therefore \left(\frac{1}{2}\right)^2 \times y = 4$

$\therefore \frac{1}{4} y = 4$ $\therefore y = 16$

4

[a] $f(x) = (x - 3)^2 + 1$

x	0	1	2	3	4	5	6
$f(x)$	10	5	2	1	2	5	10



From the graph :

1 The vertex of the curve is : (3 , 1)

2 The minimum value = 1

3 The equation of the axis of symmetry is : $x = 3$

[b] $\because \frac{x}{3} = \frac{y}{2} = \frac{z}{5} = m$

$\therefore x = 3m$, $y = 2m$, $z = 5m$

$\therefore \frac{xy + yz}{x^2 + y^2} = \frac{6m^2 + 10m^2}{9m^2 + 4m^2} = \frac{16m^2}{13m^2} = \frac{16}{13}$

5

[a] Form the table by yourself , then $\sigma \simeq 3.29$

[b] $\because f(a) = b$ $\therefore b = a^2 + b$

$\therefore a^2 = 0$ $\therefore a = 0$

$\therefore a b^2 + 5 = (0) b^2 + 5 = 5$

6 El-Monofia

1

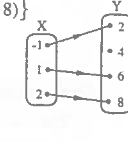
1 c 2 b 3 c 4 d 5 b 6 a

2

[a] 1 $R = \{(-1, 2), (1, 6), (2, 8)\}$

2 R is a function because every element in X has only one image in Y

, the range = $\{2, 6, 8\}$



[b] $\because$ The straight line which represents the function f cuts the y-axis at (b , 3)

$\therefore b = 0$

$\therefore$ (0 , 3) satisfies the function

$\therefore 3 = 6 \times 0 - a$ $\therefore a = -3$

$\therefore 2a - 5b = 2 \times -3 - 5 \times 0 = -6$

3

[a] 1 $X \times Y = \{(1, 2), (1, 3)\}$

2 $\because Y - Z = \{2\}$

$\therefore X \times (Y - Z) = \{1\} \times \{2\} = \{(1, 2)\}$

3 $n(Z^2) = 3 \times 3 = 9$

[b] $\because$ b is the middle proportional between a and c

$\therefore b^2 = ac$

$\therefore \frac{a^2 + b^2}{b^2} = \frac{a^2 + ac}{ac} = \frac{a(a + c)}{ac} = \frac{a + c}{c}$ (1)

$, \frac{b^2 + c^2}{c^2} = \frac{ac + c^2}{c^2} = \frac{c(a + c)}{c^2} = \frac{a + c}{c}$ (2)

From (1) , (2) : $\therefore \frac{a^2 + b^2}{b^2} = \frac{b^2 + c^2}{c^2}$

4

[a] $\because a : b : c = 2 : 3 : 5$

$\therefore a = 2m$, $b = 3m$, $c = 5m$

$, \because a + b + c = 35$

$\therefore 2m + 3m + 5m = 35$

$\therefore 10m = 35$ $\therefore m = 3.5$

$\therefore a = 7$, $b = 10.5$, $c = 17.5$

[b] 1 $\because a \propto \frac{1}{x^2}$ $\therefore a = \frac{m}{x^2}$

$\therefore 3 = \frac{m}{2^2}$ $\therefore 3 = \frac{m}{4}$ $\therefore m = 12$

$\therefore a = \frac{12}{x^2}$ $\therefore y = \frac{12}{x^2} + 7$

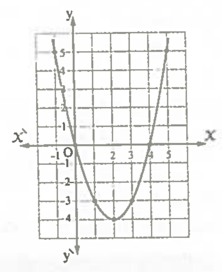
2 At $x = \sqrt{3}$ $\therefore y = \frac{12}{(\sqrt{3})^2} + 7 = 4 + 7 = 11$



5

[a] $f(x) = x^2 - 4x$

x	−1	0	1	2	3	4	5
$f(x)$	5	0	−3	−4	−3	0	5



From the graph :

1 The vertex of the curve is : (2 , − 4)

2 The equation of the line of symmetry is : $x = 2$

3 The minimum value = − 4

[b] Form the table by yourself , then $\sigma \simeq 9.32$





1

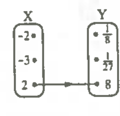
1 c 2 d 3 a 4 c 5 c 6 b



2

[a] R = {(2 , 8)}

R is not a function because the elements − 2 , − 3 belonging to X have no images in Y



[b] $\because x^4 y^2 - 14 x^2 y + 49 = 0$

$\therefore (x^2 y - 7)^2 = 0$ $\therefore x^2 y - 7 = 0$

$\therefore x^2 y = 7$ $\therefore y \propto \frac{1}{x^2}$

3

[a] $\because \frac{a}{b} = \frac{c}{d} = m$ $\therefore a = b\,m$, $c = d\,m$

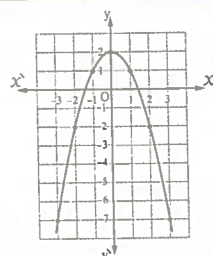
$\therefore \frac{a+b}{b} = \frac{b\,m + b}{b} = \frac{b(m+1)}{b} = m + 1$ (1)

, $\frac{c+d}{d} = \frac{d\,m + d}{d} = \frac{d(m+1)}{d} = m + 1$ (2)

From (1) , (2) : $\therefore \frac{a+b}{b} = \frac{c+d}{d}$

[b] $f(x) = 2 - x^2$

x	−3	−2	−1	0	1	2	3
$f(x)$	−7	−2	1	2	1	−2	−7



From the graph :

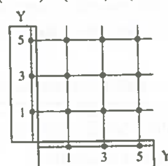
* The equation of the axis of symmetry is : $x = 0$
* The maximum value = 2



4

[a] $\because$ Y = {1 , 3 , 5}

$\therefore Y^2$ = {(1 , 1) , (1 , 3) , (1 , 5) , (3 , 1) , (3 , 3) , (3 , 5) , (5 , 1) , (5 , 3) , (5 , 5)}



[b] Let the number be x

$\therefore \frac{5 + x^2}{11 + x^2} = \frac{3}{5}$ $\therefore 25 + 5x^2 = 33 + 3x^2$

$\therefore 2x^2 = 8$ $\therefore x^2 = 4$

$\because x = 2$ or $x = -2$ (refused)

$\therefore$ The number is 2

5

[a] $\because$ The straight line which represents the function cuts the y-axis at (m , 3)

$\therefore m = 0$

$\therefore (0 , 3)$ satisfies the function

$\therefore 3 = 6 \times 0 - \ell \qquad \therefore \ell = -3$

[b] Form the table by yourself

, then $\overline{X} = 16$, $\sigma \simeq 3.9$

8 El-Dakahlia



[a] 1 a 2 c 3 b

[b] $\because$ b is the middle proportional between a , c

$\therefore b^2 = a\,c$

$\therefore \frac{a^2}{b^2} + \frac{b^2}{c^2} = \frac{a^2}{a\,c} + \frac{a\,c}{c^2} = \frac{a}{c} + \frac{a}{c} = \frac{2\,a}{c}$



[a] 1 b 2 a 3 c

[b] 1 $\because$ R is a function

$\therefore a = 5 \quad , \quad b = 7 \quad \text{or} \quad a = 7 \quad , \quad b = 5$

$\therefore 3\,a + 3\,b = 3\,(a + b) = 3 \times 12 = 36$

2 The range $= \{5 , 7\}$

3

[a] $\because \frac{a}{4\,X + y} = \frac{b}{X - 4\,y}$

Adding the antecedents and consequents of 1st and 2nd ratios

$\therefore \frac{a + b}{5\,X - 3\,y}$ = one of the given ratios (1)

Subtracting the antecedent and consequent of 2nd ratio from the antecedent and consequent of 1st ratio

$\therefore \frac{a - b}{3\,X + 5\,y}$ = one of the given ratios (2)

From (1) , (2) : $\therefore \frac{a + b}{5\,X - 3\,y} = \frac{a - b}{3\,X + 5\,y}$

[b] Form the table by yourself

, then $\sigma \simeq 3.29$

4

[a] Let $C = (0 , \ell)$

, $\because$ the curve of the function f passes through the point C

$\therefore \ell = 0^2 - (k - 2) \times 0 - k + 4$

$\therefore \ell = 4 - k \qquad \therefore B\,(4 - k , 4 - k)$

$\therefore 4 - k = (4 - k)^2 - (k - 2) \times (4 - k) - k + 4$

$\therefore (4 - k)^2 - (k - 2)\,(4 - k) = 0$

$\therefore (4 - k)\,(4 - k - k + 2) = 0$

$\therefore (4 - k)\,(6 - 2\,k) = 0$

$\therefore 4 - k = 0 \qquad \therefore k = 4$ (refused)

or $6 - 2\,k = 0 \qquad \therefore 6 = 2\,k \qquad \therefore k = 3$

[b] $\because b \propto \frac{1}{X^2} \qquad \therefore b = \frac{m}{X^2}$

$\therefore y = 1 + \frac{m}{X^2} \qquad \therefore 5 = 1 + \frac{m}{1}$

$\therefore m = 4 \qquad \therefore y = 1 + \frac{4}{X^2}$

, at $X = 2 \qquad \therefore y = 1 + \frac{4}{2^2} = 1 + 1 = 2$

5

[a] $\because 3\,f\,(2) + 3\,\ell\,(X) = 6$

$\therefore f\,(2) + \ell\,(X) = 2$

$\therefore a + 2^2 + c = 2 \qquad \therefore a + 4 + c = 2$

$\therefore a + c = -2$

$\therefore 2\,f\,(0) + 2\,\ell\,(7) = 2\,[f\,(0) + \ell\,(7)]$

$= 2\,[a + 0^2 + c]$

$= 2\,(a + c) = 2 \times -2 = -4$

[b] 1 The domain $= \{3 , 5 , 7\}$

2 The rule of the function is : $f\,(X) = 3\,X$

9 Ismailia

1

1 a 2 b 3 d 4 b 5 c 6 d

2

[a] 1 $X \times Y = \{(2 , 3) , (2 , 4) , (2 , 5) , (3 , 3) , (3 , 4) , (3 , 5)\}$

2 $X^2 = \{(2 , 2) , (2 , 3) , (3 , 2) , (3 , 3)\}$

3 $n\,(Y^2) = 3 \times 3 = 9$

[b] $\because \frac{a}{b} = \frac{4}{3} \qquad \therefore a = 4\,m \quad , \quad b = 3\,m$

$\therefore \frac{2\,a + b}{5\,a - 3\,b} = \frac{8\,m + 3\,m}{20\,m - 9\,m} = \frac{11\,m}{11\,m} = 1$

3

[a] $\because y \propto \frac{1}{X^2} \qquad \therefore \frac{y_1}{y_2} = \frac{X_2^2}{X_1^2}$

$\therefore \frac{5}{y_2} = \frac{2^2}{3^2} \qquad \therefore \frac{5}{y_2} = \frac{4}{9} \qquad \therefore y_2 = \frac{5 \times 9}{4} = \frac{45}{4}$

[b] $\because$ The straight line which represents the function cuts the y-axis at (b , 5)

$\therefore b = 0 \qquad \therefore (0 , 5)$ satisfies the function

$\therefore 5 = 3 \times 0 - a \quad \therefore a = -5$

4

[a] $\because \frac{1+2X}{3+2X}=\frac{3+2X}{7+2X}$

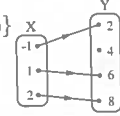
$\therefore (1+2X)(7+2X)=(3+2X)^2$

$\therefore 7+16X+4X^2=9+12X+4X^2$

$\therefore 7+16X=9+12X$

$\therefore 4X=2 \qquad \therefore X=\frac{1}{2}$

[b] 1 $R=\{(-1,2),(1,6),(2,8)\}$

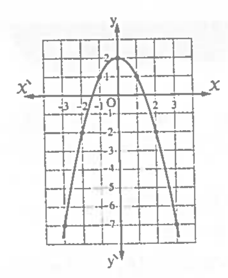


2 R is a function because every element in X has only one image in Y

5

[a] $f(X)=2-X^2$

X	-3	-2	-1	0	1	2	3
$f(X)$	-7	-2	1	2	1	-2	-7



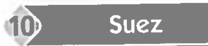
From the graph :

1 The vertex of the curve is : $(0,2)$

2 The equation of the axis of symmetry is : $X=0$

3 The maximum value = 2

[b] Form the table by yourself , then $\sigma \simeq 3.29$



10 Suez

1

1 a 2 c 3 d 4 b 5 c 6 b

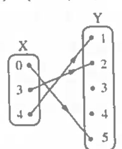
2

[a] $\because \frac{a}{b}=\frac{3}{4} \qquad \therefore a=3m \quad , \quad b=4m$

$\therefore \frac{4a+b}{2a-b}=\frac{12m+4m}{6m-4m}=\frac{16m}{2m}=8$

[b] 1 $R=\{(0,5),(3,2),(4,1)\}$

2



3 Yes , R is a function.

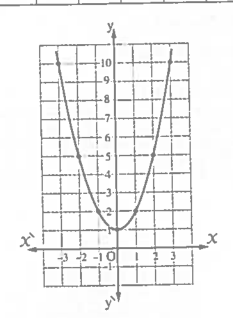
3

[a] 1 $X=\{2,3\} \quad , \quad Y=\{6,9\}$

2 $Y\times Y=\{(6,6),(6,9),(9,6),(9,9)\}$

[b] $f(X)=1+X^2$

X	-3	-2	-1	0	1	2	3
$f(X)$	10	5	2	1	2	5	10



From the graph :

1 The vertex of the curve is : $(0,1)$

2 The equation of the axis of symmetry is : $X=0$

3 The minimum value = 1

4

[a] $\because \frac{X}{y}=\frac{z}{r}=m \qquad \therefore X=ym \quad , \quad z=rm$

$\therefore \frac{X^2+2z^2}{y^2+2r^2}=\frac{y^2m^2+2r^2m^2}{y^2+2r^2}=\frac{m^2(y^2+2r^2)}{y^2+2r^2}=m^2 \quad (1)$

$, \frac{Xz}{yr}=\frac{ym\times rm}{yr}=m^2 \quad (2)$

From (1) , (2) : $\therefore \frac{X^2+2z^2}{y^2+2r^2}=\frac{Xz}{yr}$

[b] 1 The variation is inverse.

2 $\because y \propto \frac{1}{X} \qquad \therefore Xy=m \qquad \therefore m=12$

3 At $X=3 \qquad \therefore 3y=12 \qquad \therefore y=4$

5

[a] 1 $f(2) + g(2) = 2^2 - 3 \times 2 + 2 - 3$

$= 4 - 6 - 1 = -3$

2 $f(3) + g(3) = 3^2 - 3 \times 3 + 3 - 3$

$= 9 - 9 + 3 - 3$

$= 0$

[b] Form the table by yourself , then $\sigma \simeq 3.29$

11 Port Said

1

1 c   2 b   3 d   4 d   5 a   6 a

2

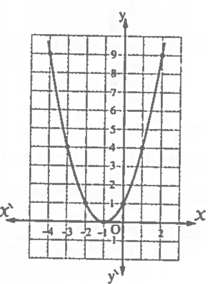
[a] 1 $n(X \times Z) = 2 \times 2 = 4$

2 $\because X - Y = \{1\}$

$\therefore (X - Y) \cap Z = \varnothing$

[b] $f(x) = x^2 + 2x + 1$

x	-4	-3	-2	-1	0	1	2
$f(x)$	9	4	1	0	1	4	9



From the graph :

1 The vertex of the curve is : $(-1 , 0)$

2 The minimum value = 0

3

[a] $\because f(3) = 15$ $\therefore 15 = 4 \times 3 + b$

$\therefore 15 = 12 + b$ $\therefore b = 3$

[b] 1 $\because y \propto \frac{1}{x}$ $\therefore x y = m$ $\therefore 2.5 \times 6 = m$

$\therefore m = 15$ $\therefore x y = 15$

2 At $x = 5$ $\therefore 5 y = 15$ $\therefore y = 3$

4

[a] 1 $R = \{(1 , 12) , (1 , 21) , (2 , 12) , (2 , 21) , (2 , 52)\}$



2 2 R 21 because $2 \in X$ its image in Y is 21

[b] $\because \frac{7}{x} = \frac{x}{\frac{1}{y}}$ $\therefore \frac{7}{x} = x y$

$\therefore x^2 y = 7$ $\therefore (x^2 y)^2 = 7^2$ $\therefore x^4 y^2 = 49$

5

[a] $\because \frac{x}{3} = \frac{y}{4} = \frac{z}{5} = m$

$\therefore x = 3m$, $y = 4m$, $z = 5m$

$\therefore \frac{2y - z}{3x - 2y + z} = \frac{8m - 5m}{9m - 8m + 5m} = \frac{3m}{6m} = \frac{1}{2}$

[b] Form the table by yourself , then $\bar{x} = 8$, $\sigma \simeq 4$

12 Damietta

1

1 a   2 b   3 d   4 d   5 c   6 b

2

[a] 1 $n(X \times Y) = 2 \times 2 = 4$

2 $\because X - Y = \{5\}$

$\therefore (X - Y) \times Z = \{5\} \times \{3\} = \{(5 , 3)\}$

3 $Y^2 = \{(1 , 1) , (1 , 2) , (2 , 1) , (2 , 2)\}$

[b] $\because \frac{a}{b} = \frac{b}{c} = m$ $\therefore b = c m$, $a = c m^2$

$\therefore \frac{a - b}{a - c} = \frac{c m^2 - c m}{c m^2 - c} = \frac{c m (m - 1)}{c (m^2 - 1)}$

$= \frac{m (m - 1)}{(m - 1)(m + 1)} = \frac{m}{m + 1}$ (1)

$, \frac{b}{b + c} = \frac{c m}{c m + c} = \frac{c m}{c (m + 1)} = \frac{m}{m + 1}$ (2)

From (1) , (2) : $\therefore \frac{a - b}{a - c} = \frac{b}{b + c}$

3

[a] 1 $R = \{(1 , 6) , (3 , 4) , (4 , 3) , (5 , 2)\}$

2 R is a function because every element in X has only one image in Y

, the range = $\{6 , 4 , 3 , 2\}$

[b] $\because \frac{21 X - y}{7 X - z} = \frac{y}{z}$

$\therefore 7 X y - y z = 21 X z - y z$

$\therefore 7 X y = 21 X z$

$\therefore y = 3 z$ $\therefore y \propto z$

4

[a] Form the table by yourself , then $\sigma \simeq 3.29$

[b] 1 $\because y \propto X$ $\therefore y = m X$

$\therefore 6 = 3 m$ $\therefore m = 2$ $\therefore y = 2 X$

2 At $X = 5$ $\therefore y = 2 \times 5 = 10$

5

[a] $\because \frac{X}{3} = \frac{y}{4} = \frac{z}{5} = m$

$\therefore X = 3 m$, $y = 4 m$, $z = 5 m$

$\therefore \sqrt{3 X^2 + 3 y^2 + z^2} = \sqrt{27 m^2 + 48 m^2 + 25 m^2}$

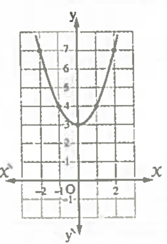
$= \sqrt{100 m^2} = 10 m$ (1)

$, 2 X + y = 6 m + 4 m = 10 m$ (2)

From (1) , (2) : $\therefore \sqrt{3 X^2 + 3 y^2 + z^2} = 2 X + y$

[b] $f(X) = X^2 + 3$

X	−2	−1	0	1	2
$f(X)$	7	4	3	4	7



From the graph :

1 The equation of symmetry line is : $X = 0$

2 The minimum value = 3



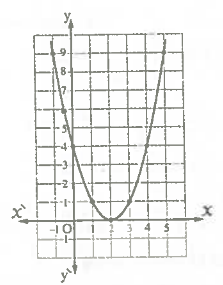
13 Kafr El-Sheikh

1

[a] 1 c 2 d 3 b

[b] $f(X) = (X - 2)^2$

X	−1	0	1	2	3	4	5
$f(X)$	9	4	1	0	1	4	9



From the graph :

* The vertex of the curve is : (2 , 0)
* The equation of the symmetry axis is : $X = 2$
* The minimum value = 0

2

[a] 1 a 2 c 3 d

[b] $\because \frac{X}{y} = \frac{y}{z} = m$ $\therefore y = z m$, $X = z m^2$

$\therefore \frac{X - y}{X - z} = \frac{z m^2 - z m}{z m^2 - z} = \frac{z m (m - 1)}{z (m - 1)(m + 1)}$

$= \frac{m}{m + 1}$ (1)

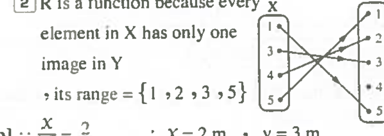
$, \frac{y}{y + z} = \frac{z m}{z m + z} = \frac{z m}{z (m + 1)} = \frac{m}{m + 1}$ (2)

From (1) , (2) : $\therefore \frac{X - y}{X - z} = \frac{y}{y + z}$

3

[a] 1 R = {(1 , 5) , (3 , 3) , (4 , 2) , (5 , 1)}

2 R is a function because every element in X has only one image in Y , its range = {1 , 2 , 3 , 5}



[b] $\because \frac{X}{y} = \frac{2}{3}$ $\therefore X = 2 m$, $y = 3 m$

$\therefore \frac{3 X + 2 y}{6 y - X} = \frac{6 m + 6 m}{18 m - 2 m} = \frac{12 m}{16 m} = \frac{3}{4}$

4

[a] 1 X × Y = {(2 , 4) , (2 , 0) , (−1 , 4) , (−1 , 0)}

2 $\because Y \cap Z = \{4\}$

$\therefore (Y \cap Z) \times X = \{4\} \times \{2 , -1\}$

$= \{(4 , 2) , (4 , -1)\}$

3 $n(Y^2) = 2 \times 2 = 4$

[b] $\because f(2) = 1$ $\therefore 1 = 2 \times 2 + a$

$\therefore 1 = 4 + a$ $\therefore a = -3$

5

[a] 1 $\because y \propto \frac{1}{x^2}$ $\therefore x^2 y = m$

$\therefore (4)^2 \times 2 = m$ $\therefore m = 32$

$\therefore x^2 y = 32$

2 At $x = 16$ $\therefore (16)^2 \times y = 32$ $\therefore y = \frac{1}{8}$

[b] Form the table by yourself

, then $\overline{x} = 7$, $\sigma \simeq 1.41$



14 El-Beheira



1

1 d 2 b 3 c 4 a 5 b 6 c



2

[a] 1 $\because Y \cap Z = \{2\}$

$\therefore X \times (Y \cap Z) = \{1\} \times \{2\} = \{(1, 2)\}$

2 $n(Z^2) = 3 \times 3 = 9$

[b] Let the number be x

$\therefore \frac{5 + x^2}{11 + x^2} = \frac{3}{5}$ $\therefore 25 + 5x^2 = 33 + 3x^2$

$\therefore 2x^2 = 8$ $\therefore x^2 = 4$

$\therefore x = -2$ (refused) or $x = 2$

$\therefore$ The number is 2

3

[a] $\because$ (a , 3) satisfies the function

$\therefore 3 = 4a - 5$ $\therefore 4a = 8$ $\therefore a = 2$

[b] $\because \frac{a + b}{3} = \frac{b + c}{6} = \frac{c + a}{5}$

Adding the antecedents and consequents of the three ratios

$\therefore \frac{a + b + b + c + c + a}{3 + 6 + 5} = \frac{2a + 2b + 2c}{14}$

$= \frac{a + b + c}{7}$

= one of the given ratios (1)

Mutiplying the terms of the 2nd ratio by – 1 and adding the antecedents and consequents of the three ratios

$\therefore \frac{a + b - b - c + c + a}{3 - 6 + 5} = \frac{2a}{2} = a$

= one of the given ratios (2)

From (1) , (2) : $\therefore \frac{a + b + c}{7} = a$

$\therefore \frac{a + b + c}{a} = 7$

4

[a] 1 $R = \{(1, 5), (3, 3), (5, 1)\}$

2 R is a function because every element in X has only one image in X

, its range = $\{5, 3, 1\}$

[b] Form the table by yourself , then $\sigma \simeq 2.28$



5

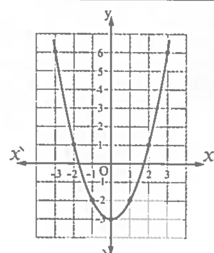
[a] 1 $\because y \propto x$ $\therefore y = m x$

$\therefore 6 = 3m$ $\therefore m = 2$ $\therefore y = 2x$

2 At $x = 5$ $\therefore y = 2 \times 5 = 10$

[b] $f(x) = x^2 - 3$

x	– 3	– 2	– 1	0	1	2	3
$f(x)$	6	1	– 2	– 3	– 2	1	6



From the graph :

1 The equation of the axis of symmetry is : $x = 0$

2 The minimum value = – 3





15 El-Fayoum

1

1 d 2 c 3 a 4 b 5 b 6 c

2

[a] $\because \frac{a}{b} = \frac{2}{3}$ $\therefore a = 2m$, $b = 3m$

$\therefore \frac{3a - b}{a + 2b} = \frac{6m - 3m}{2m + 6m} = \frac{3m}{8m} = \frac{3}{8}$

[b] $\because f(-3) = 8$ $\therefore 8 = -3a + 5$

$\therefore -3a = 3$ $\therefore a = -1$

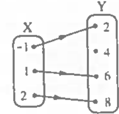
3

[a] $\because \frac{x}{y} = \frac{y}{z}$ $\quad \therefore y^2 = x z$

$$\frac{x^2+y^2}{y^2+z^2} = \frac{x^2+x z}{x z+z^2} = \frac{x(x+z)}{z(x+z)} = \frac{x}{z}$$

[b] $R = \{(-1, 2), (1, 6), (2, 8)\}$

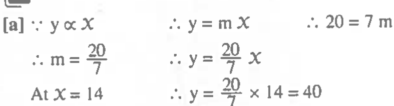
R is a function because every element in X has only one image in Y



4

[a] $\because y \propto x$ $\quad \therefore y = m x$ $\quad \therefore 20 = 7 m$

$\therefore m = \frac{20}{7}$ $\quad \therefore y = \frac{20}{7} x$



At $x = 14$ $\quad \therefore y = \frac{20}{7} \times 14 = 40$

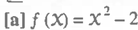
[b] $\because (5 - 2x, y^3) = (1, 27)$

$\therefore 5 - 2x = 1$ $\quad \therefore -2x = -4$ $\quad \therefore x = 2$

$, y^3 = 27$ $\quad \therefore y = 3$

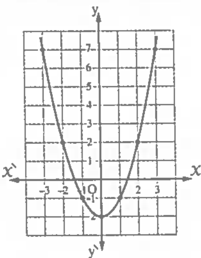
$\therefore \sqrt{3x + y} = \sqrt{3 \times 2 + 3} = 3$

5



[a] $f(x) = x^2 - 2$

x	−3	−2	−1	0	1	2	3
$f(x)$	7	2	−1	−2	−1	2	7



From the graph :

* The vertex of the curve is : $(0, -2)$
* The minimum value $= -2$

[b] Form the table by yourself, then $\sigma \simeq 4$



1

1 c  2 b  3 a  4 d 5 a 6 d

2

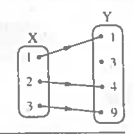
[a] Let the number be x

$\therefore \frac{7+x}{11+x} = \frac{2}{3}$ $\quad \therefore 21 + 3x = 22 + 2x$

$\therefore x = 1$ $\quad \therefore$ The number is 1

[b] $R = \{(1, 1), (2, 4), (3, 9)\}$

R is a function because every element in X has only one image in Y



3

[a] $\because \frac{x}{2} = \frac{y}{3} = \frac{z}{4} = \frac{3x - 2y + 5z}{5k}$

Multiplying the two terms of the 1st ratio by 3, the two terms of the 2nd ratio by −2, the two terms of the 3rd ratio by 5 and adding the antecedents and consequents of the three ratios

$\therefore \frac{3x - 2y + 5z}{6 - 6 + 20} = \frac{3x - 2y + 5z}{20}$

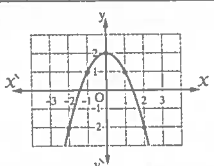
= one of the given ratios

$\therefore \frac{3x - 2y + 5z}{5k} = \frac{3x - 2y + 5z}{20}$

$\therefore 5k = 20$ $\quad \therefore k = 4$

[b] $f(x) = 2 - x^2$

x	−2	−1	0	1	2
$f(x)$	−2	1	2	1	−2



From the graph :

* The vertex of the curve is : $(0, 2)$
* The maximum value $= 2$

4

[a] $\because y \propto x$ $\quad \therefore y = m x$

$\therefore 3 = 15 m$ $\quad \therefore m = \frac{1}{5}$ $\quad \therefore y = \frac{1}{5} x$

at $y = 100$ $\quad \therefore 100 = \frac{1}{5} x$ $\quad \therefore x = 500$

[b] 1 $X \times Y = \{(1, 3), (1, 4), (1, 5), (2, 3), (2, 4), (2, 5)\}$

2 $Y \times X = \{(3, 1), (3, 2), (4, 1), (4, 2), (5, 1), (5, 2)\}$

3 $X^2 = \{(1, 1), (1, 2), (2, 1), (2, 2)\}$

5

[a] $\because f(3) + g(5) = 15$ $\therefore 3 \times 3 + k + k = 15$

$\therefore 9 + 2k = 15$ $\therefore 2k = 6$ $\therefore k = 3$

[b] Form the table by yourself , then $\sigma \simeq 3.29$

17 El-Menia

1

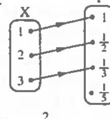
1 d 2 c 3 b 4 a 5 d 6 a

2

[a] $R = \left\{(1, 1), \left(2, \frac{1}{2}\right), \left(3, \frac{1}{3}\right)\right\}$

R is a function because every element in X has only one image in Y





[b] $\because \frac{a}{b} = \frac{b}{c} = m$ $\therefore b = cm , a = cm^2$

$\therefore \frac{a+b}{a-c} = \frac{cm^2 + cm}{cm^2 - c} = \frac{cm(m+1)}{c(m^2-1)}$

$= \frac{m(m+1)}{(m+1)(m-1)} = \frac{m}{m-1}$ (1)

$, \frac{b}{b-c} = \frac{cm}{cm-c} = \frac{cm}{c(m-1)} = \frac{m}{m-1}$ (2)

From (1) and (2) : $\therefore \frac{a+b}{a-c} = \frac{b}{b-c}$

3

[a] $\because \frac{x}{y} = \frac{2}{3}$ $\therefore x = 2m , y = 3m$

$\therefore \frac{3x + 2y}{6y - x} = \frac{6m + 6m}{18m - 2m} = \frac{12m}{16m} = \frac{3}{4}$

[b] 1 $\because Y \cap Z = \{5\}$

$\therefore X \times (Y \cap Z) = \{3, 4\} \times \{5\}$

$= \{(3, 5), (4, 5)\}$

2 $\because X - Y = \{3\}$

$\therefore (X - Y) \times Z = \{3\} \times \{6, 5\}$

$= \{(3, 6), (3, 5)\}$

4

[a] 1 $\because y \propto \frac{1}{x}$ $\therefore xy = m$

$\therefore 2 \times 3 = m$ $\therefore m = 6$ $\therefore xy = 6$

2 At $y = 4$ $\therefore 4x = 6$ $\therefore x = \frac{3}{2}$

[b] Form the table by yourself , then $\sigma \simeq 3.29$

5

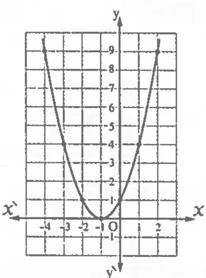
[a] The function f is of the 3rd degree

$, f(0) = 3 - 2 \times (0)^3 = 3$

$, f(-2) = 3 - 2(-2)^3 = 19$

[b] $f(x) = x^2 + 2x + 1$

x	−4	−3	−2	−1	0	1	2
$f(x)$	9	4	1	0	1	4	9



From the graph :

1 The equation of the symmetry axis is : $x = -1$

2 The minimum value = 0

18 Assiut

1

1 b 2 d 3 a 4 c 5 a 6 b

2

[a] 1 $\because X \cap Y = \{7\}$

$\therefore (X \cap Y) \times X = \{7\} \times \{6, 7\}$

$= \{(7, 6), (7, 7)\}$

2 $n(Y^2) = 2 \times 2 = 4$

[b] $\because \frac{a}{2} = \frac{b}{3} = \frac{c}{4} = m$

$\therefore a = 2m , b = 3m , c = 4m$

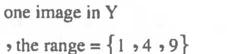
$\therefore \frac{3c - b}{a + b} = \frac{12m - 3m}{2m + 3m} = \frac{9m}{5m} = \frac{9}{5}$

3

[a] $R = \{(-1, 1), (2, 4), (3, 9)\}$

R is a function because every element in X has only one image in Y

, the range = $\{1, 4, 9\}$



[b] 1 $\because y \propto \frac{1}{x}$ $\quad \therefore xy = m$

$\therefore 4 \times 3 = m$ $\quad \therefore m = 12$ $\quad \therefore xy = 12$

2 At $x = \frac{3}{4}$ $\quad \therefore \frac{3}{4} y = 12$ $\quad \therefore y = 16$

4

[a] Let the number be x

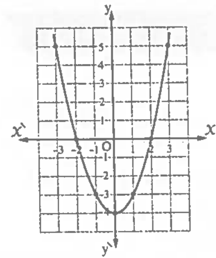
$\therefore \frac{7 + x^2}{11 + x^2} = \frac{2}{3}$ $\quad \therefore 21 + 3x^2 = 22 + 2x^2$

$\therefore x^2 = 1$ $\quad \therefore x = -1$ (refused) or $x = 1$

$\therefore$ The number is 1

[b] $f(x) = x^2 - 4$

x	−3	−2	−1	0	1	2	3
$f(x)$	5	0	−3	−4	−3	0	5



From the graph :

* The vertex of the curve is : (0 , − 4)
* The minimum value = − 4
* The equation of the axis of symmetry is : $x = 0$



5

[a] $f(\sqrt{2}) + g(5) = (\sqrt{2})^2 - 2 + 3$

$= 2 - 2 + 3 = 3$

[b] Form the table by yourself

, then $\overline{X} = 15$, $\sigma \simeq 3.29$





1

1 c 2 a 3 d 4 b 5 b 6 c



2

[a] 1 $X = \{1\}$, $Y = \{1, 3, 5\}$

2 $Y \times X = \{(1, 1), (3, 1), (5, 1)\}$

[b] $\because \frac{x}{y} = \frac{2}{3}$ $\quad \therefore x = 2m$, $y = 3m$

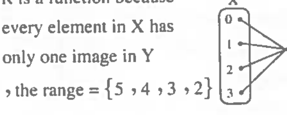
$\therefore \frac{3x + 2y}{6y - x} = \frac{6m + 6m}{18m - 2m} = \frac{12m}{16m} = \frac{3}{4}$

3

[a] 1 $R = \{(0, 5), (1, 4), (2, 3), (3, 2)\}$

2 R is a function because every element in X has only one image in Y

, the range = $\{5, 4, 3, 2\}$



[b] Let the number be x

$\therefore \frac{7 + x}{11 + x} = \frac{2}{3}$ $\quad \therefore 21 + 3x = 22 + 2x$

$\therefore x = 1$ $\quad \therefore$ The number is 1

4

[a] $\because$ (a , 3) satisfies the relation

$\therefore 3 = 4a - 5$ $\quad \therefore 4a = 8$ $\quad \therefore a = 2$

[b] 1 $\because y \propto x$ $\quad \therefore y = mx$

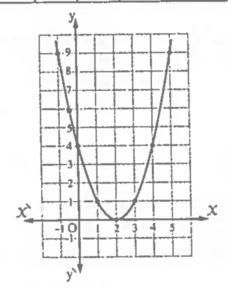
$\therefore 6 = 3m$ $\quad \therefore m = 2$ $\quad \therefore y = 2x$

2 At $x = 5$ $\quad \therefore y = 2 \times 5 = 10$

5

[a] $f(x) = x^2 - 4x + 4$

x	−1	0	1	2	3	4	5
$f(x)$	9	4	1	0	1	4	9



From the graph :

1 The vertex of the curve is : (2 , 0)

2 The equation of the axis of symmetry is : $x = 2$

[b] Form the table by yourself

, then $\overline{X} = 16$, $\sigma \simeq 3.29$



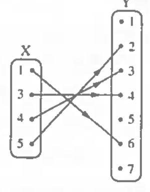


1

1 a 2 c 3 c 4 b 5 b 6 d

2

[a] $R = \{(1 , 6) , (3 , 4) , (4 , 3) , (5 , 2)\}$



R is a function because every element in X has only one image in Y

, its range $= \{2 , 3 , 4 , 6\}$

[b] ∵ b is the middle proportional between a and c

$\therefore b^2 = a\,c$

$\therefore \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + a\,c}{a\,c + c^2} = \frac{a\,(a + c)}{c\,(a + c)} = \frac{a}{c}$

3

[a] 1 $f\left(\sqrt{2}\right) + 3\,g\left(\sqrt{2}\right)$

$= \left(\sqrt{2}\right)^2 - 3\sqrt{2} + 3\left(\sqrt{2} - 3\right)$

$= 2 - 3\sqrt{2} + 3\sqrt{2} - 9 = -7$

2 ∵ $f(3) = 3^2 - 3 \times 3 = 0$

, $g(3) = 3 - 3 = 0$

$\therefore f(3) = g(3)$

[b] Let the number be X

$\therefore \frac{7 + X}{11 + X} = \frac{2}{3}$ $\quad\therefore 21 + 3X = 22 + 2X$

$\therefore X = 1$ $\quad$ ∴ The number is 1

4

[a] ∵ $\frac{a}{b} = \frac{3}{5}$ $\quad\therefore a = 3\,m$, $b = 5\,m$

$\therefore \frac{7\,a + 9\,b}{4\,a + 2\,b} = \frac{21\,m + 45\,m}{12\,m + 10\,m} = \frac{66\,m}{22\,m} = 3$

[b] Form the tables by yourself , then $\sigma \simeq 1.73$

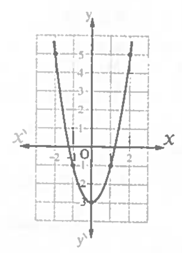
5

[a] ∵ $y \propto X$ $\quad\therefore \frac{y_1}{y_2} = \frac{X_1}{X_2}$

$\therefore \frac{40}{80} = \frac{14}{X_2}$ $\quad\therefore X_2 = \frac{80 \times 14}{40} = 28$

[b] $f(X) = 2X^2 - 3$

X	−2	−1	0	1	2
$f(X)$	5	−1	−3	−1	5



From the graph :

1 The vertex of the curve is : (0 , − 3)

2 The equation of the axis of symmetry is : $X = 0$

3 The minimum value = − 3

21 Luxor

1

1 d $\quad$ 2 c $\quad$ 3 b $\quad$ 4 a $\quad$ 5 b $\quad$ 6 d

2

[a] 1 The domain $= \{1 , 2 , 3 , 4 , 5\}$

2 The range $= \{3 , 5 , 7 , 9 , 11\}$

3 $f(X) = 2X + 1$

[b] Let the two numbers be $2X$, $3X$

$\therefore \frac{2X - 7}{3X - 7} = \frac{1}{2}$ $\quad\therefore 4X - 14 = 3X - 7$

$\therefore X = 7$

∴ The two numbers are : 14 , 21

3

[a] 1 ∵ R is a function from X to Y

∴ Each element in X has only one image in Y

, ∵ the image of $-2 = (-2)^2 - 1 = 3 \in Y$

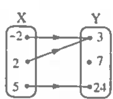
, the image of $2 = (2)^2 - 1 = 3 \in Y$

, the image of $5 = (5)^2 - 1 = 24 \in Y$

$\therefore \ell = 24$

2 $R = \{(-2 , 3) , (2 , 3) , (5 , 24)\}$

3



[b] ∵ $y = a - 9$, $y \propto \frac{1}{X^2}$ $\quad\therefore y = \frac{m}{X^2}$

$\therefore \frac{m}{X^2} = a - 9$ $\quad\therefore m = X^2\,(a - 9)$

$\therefore m = \left(\frac{2}{3}\right)^2 (18 - 9) = 4$

$\therefore y = \frac{4}{x^2}$

at $x = 1$ $\therefore y = 4$

4

[a] Let A $(x , 0)$

, $\because$ A $(x , 0)$ belongs to the straight line of the function f

$\therefore 4 - 2x = 0$ $\therefore -2x = -4$

$\therefore x = 2$ $\therefore$ A $(2 , 0)$

, let B $(0 , y)$

, $\because$ B $(0 , y)$ belongs to the straight line of the function f

$\therefore 4 - 2 \times 0 = y$ $\therefore y = 4$

$\therefore$ B $(0 , 4)$

, the area of Δ AOB $= \frac{1}{2} \times 2 \times 4 = 4$ square unit.

[b] $\because \frac{x}{7} = \frac{y}{3}$ $\therefore x = 7m$, $y = 3m$

, $\because \frac{2x - 3y}{x + 2y} = \frac{14m - 9m}{7m + 6m} = \frac{5m}{13m} = \frac{5}{13}$ (1)

, $\frac{10}{26} = \frac{5}{13}$ (2)

From (1) , (2) : $\therefore \frac{2x - 3y}{x + 2y} = \frac{10}{26}$

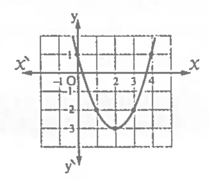
$\therefore (2x - 3y) , (x + 2y) , 10 , 26$ are proportional.

5

[a] Form the table by yourself , then $\sigma \simeq 7.07$

[b] $f(x) = 1 - 4x + x^2$

x	0	1	2	3	4
$f(x)$	1	-2	-3	-2	1



From the graph :

1 The vertex of the curve is : $(2 , -3)$

2 The equation of the axis of symmetry is : $x = 2$

3 The minimum value $= -3$

22 Aswan

1

1 c 2 d 3 a 4 c 5 b 6 c

2

[a] 1 $Y = \{2 , 5 , 7\}$

2 $Y \times X = \{(2 , 2) , (5 , 2) , (7 , 2)\}$

[b] $\because \frac{a}{b} = \frac{b}{c} = m$ $\therefore b = cm$, $a = cm^2$

$\therefore \frac{a - b}{a - c} = \frac{cm^2 - cm}{cm^2 - c} = \frac{cm(m - 1)}{c(m^2 - 1)}$

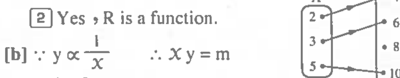
$= \frac{cm(m - 1)}{c(m - 1)(m + 1)} = \frac{m}{m + 1}$ (1)

, $\frac{b}{b + c} = \frac{cm}{cm + c} = \frac{cm}{c(m + 1)} = \frac{m}{m + 1}$ (2)

From (1) and (2) : $\therefore \frac{a - b}{a - c} = \frac{b}{b + c}$

3

[a] 1 $R = \{(2 , 4) , (3 , 6) , (5 , 10)\}$



2 Yes , R is a function.

[b] $\because y \propto \frac{1}{x}$ $\therefore xy = m$

$\therefore 4 \times 2 = m$

$\therefore m = 8$ $\therefore xy = 8$

at $x = 16$ $\therefore 16y = 8$ $\therefore y = \frac{1}{2}$

4

[a] $\because (a , 3)$ satisfies the function.

$\therefore 3 = 4a - 5$ $\therefore 4a = 8$ $\therefore a = 2$

[b] $\because \frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - b + 5c}{3x}$

Multiplying the two terms of the 1st ratio by 2 and the 2nd by -1 and the 3rd by 5 and adding the antecedents and consequents of the three ratios

$\therefore \frac{2a - b + 5c}{4 - 3 + 20}$ = one of the given ratios

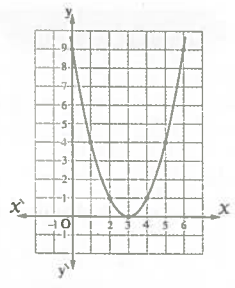
$\therefore \frac{2a - b + 5c}{21} = \frac{2a - b + 5c}{3x}$

$\therefore 3x = 21$ $\therefore x = 7$

5

[a] $f(x) = (x - 3)^2$

x	0	1	2	3	4	5	6
$f(x)$	9	4	1	0	1	4	9



From the graph :

* The vertex of the curve is : (3 , 0)

* The minimum value = 0

* The equation of the axis of symmetry is : $x = 3$

[b] Form the tables by yourself , then $\overline{x} = 2$, $\sigma \simeq 0.96$



23 New Valley



1

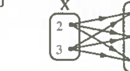
1 d 2 b 3 b 4 d 5 a 6 a



2

[a] 1 X × Y = {(2 , 3) , (2 , 4) , (2 , 5) , (3 , 3) , (3 , 4) , (3 , 5)}

2 n (X × Y) = 6



[b] $\because x^2 y^2 - 14 x y + 49 = 0$

$\therefore (x y - 7)^2 = 0$ $\therefore x y - 7 = 0$

$\therefore x y = 7$ $\therefore y \propto \frac{1}{x}$

3

[a] Let the number be x

$\therefore \frac{7 + x^2}{11 + x^2} = \frac{4}{5}$

$\therefore 35 + 5 x^2 = 44 + 4 x^2$ $\therefore x^2 = 9$

$\therefore x = 3$ (refused) or $x = -3$

$\therefore$ The number is -3

[b] R = {(4 , 2) , (8 , 4)}

R is not a function because 2 ∈ X has no image in X

4

[a] 1 $\because \frac{a}{2} = \frac{b}{3} = \frac{c}{4} = \frac{2a - 5b + 3c}{x}$

Multiplying the terms of the 1st ratio by 2 and the 2nd ratio by − 5 and the 3rd ratio by 3 and adding the antecedents and consequents of the three ratios

$\therefore \frac{2a - 5b + 3c}{4 - 15 + 12}$ = one of the given ratios

$\therefore \frac{2a - 5b + 3c}{1} = \frac{2a - 5b + 3c}{x}$ $\therefore x = 1$

2 Adding the antecedents and consequents of the three ratios

$\therefore \frac{a + b + c}{2 + 3 + 4}$ = one of the given ratios

$\therefore \frac{a + b + c}{9} = \frac{b}{3}$ $\therefore \frac{a + b + c}{b} = \frac{9}{3} = 3$

[b] 1 $\because f(k) = 5$ $\therefore 5 = 2k - 3$

$\therefore 2k = 8$ $\therefore k = 4$

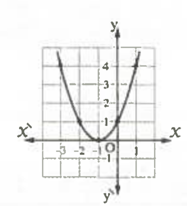
2 $\because (2 , k) \in f$ $\therefore k = 2 \times 2 - 3 = 1$

5

[a] Form the tables by yourself , then $\overline{x} = 7$, $\sigma \simeq 2$

[b] $f(x) = (x + 1)^2$

x	−3	−2	−1	0	1
$f(x)$	4	1	0	1	4



From the graph :

1 The vertex of the curve is : (− 1 , 0)

2 The equation of the symmetry axis is : $x = -1$

3 The minimum value = 0

24 South Sinai

1

1 a 2 b 3 c 4 d 5 a 6 d

2

R = {(2 , 4) , (3 , 6) , (4 , 8)}

Yes , R is a function , its range = {4 , 6 , 8}



3

[a] Let the number be x

$\therefore \frac{7+x}{11+x} = \frac{2}{3}$ $\quad\therefore 21 + 3x = 22 + 2x$

$\therefore x = 1$ $\quad\therefore$ The number is 1

[b] $\because y \propto x$ $\quad\therefore y = m x$

$\therefore 14 = 42\,m$ $\quad\therefore m = \frac{1}{3}$ $\quad\therefore y = \frac{1}{3} x$

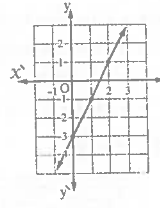
at $x = 60$ $\quad\therefore y = \frac{1}{3} \times 60 = 20$



4

[a] $f(x) = 2x - 3$

x	0	1	2
$f(x)$	−3	−1	1



[b] $\because$ b is the middle proportional between a , c

$\therefore b^2 = a c$

$\therefore \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + a c}{a c + c^2} = \frac{a(a+c)}{c(a+c)} = \frac{a}{c}$



5

[a] $\because (x^3 , y + 1) = (27 , \sqrt[3]{125})$

$\therefore x^3 = 27$ $\quad\therefore x = 3$

$, y + 1 = \sqrt[3]{125}$ $\quad\therefore y + 1 = 5$ $\quad\therefore y = 4$

[b] Form the table by yourself , then $\overline{x} = 20$

$, \sigma \simeq 2.28$



25 North Sinai



1

1 d 2 c 3 c 4 d 5 b 6 a



2

[a] $R = \{(1 , 1) , (2 , \frac{1}{2}) , (3 , \frac{1}{3})\}$

Yes , R is a function



[b] 1 $\because y \propto \frac{1}{x}$ $\quad\therefore x y = m$

$\therefore 2 \times 3 = m$ $\quad\therefore m = 6$ $\quad\therefore x y = 6$

2 At $x = 1.5$ $\quad\therefore 1.5\,y = 6$ $\quad\therefore y = 4$

3

[a] $\because$ (3 , b) satisfies the function.

$\therefore b = 5 \times 3 + 4 = 19$

[b] $\because \frac{x}{y} = \frac{3}{4}$ $\quad\therefore x = 3\,m$, $y = 4\,m$

$\therefore \frac{3x + y}{x + 5y} = \frac{9m + 4m}{3m + 20m} = \frac{13m}{23m} = \frac{13}{23}$

4

[a] $X = \{1 , 4 , 5\}$, $Y = \{2\}$

$, Y^2 = \{(2 , 2)\}$

[b] $\because$ b is the middle proportional between a , c

$\therefore b^2 = a c$

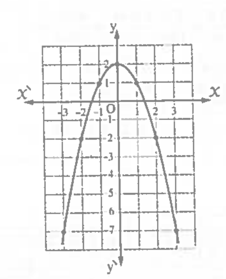
$\therefore \frac{5c^2 - 2b^2}{5b^2 - 2a^2} = \frac{5c^2 - 2ac}{5ac - 2a^2} = \frac{c(5c - 2a)}{a(5c - 2a)} = \frac{c}{a}$

5

[a] Form the table by yourself , then $\sigma \simeq 3.29$

[b] $f(x) = 2 - x^2$

x	−3	−2	−1	0	1	2	3
$f(x)$	−7	−2	1	2	1	−2	−7



From the graph :

1 The vertex of the curve is : (0 , 2)

2 The equation of the axis of symmetry is : $x = 0$

3 The maximum value = 2



26 Red Sea



1

1 b 2 a 3 c 4 d 5 c 6 a

2

[a] 1 $X = \{1\}$ 2 $n(Y) = 3$

3 $Y \times X = \{(1, 1), (5, 1), (7, 1)\}$

[b] $\because$ b is the middle proportional between a , c

$\therefore b^2 = ac$

$\therefore \frac{a^2 + b^2}{b^2 + c^2} = \frac{a^2 + ac}{ac + c^2} = \frac{a(a+c)}{c(a+c)} = \frac{a}{c}$

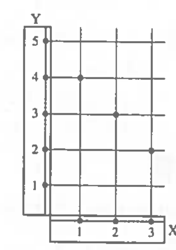
3

[a] $\because f(2) = 15$ $\therefore 15 = 4 \times 2 + a$

$\therefore 15 = 8 + a$ $\therefore a = 7$

[b] 1 $R = \{(1, 4), (2, 3), (3, 2)\}$

2 Yes , R is a function.



4

[a] $\because \frac{X}{y} = \frac{2}{3}$ $\therefore X = 2m$, $y = 3m$

$\therefore \frac{3X + 2y}{6y - X} = \frac{6m + 6m}{18m - 2m} = \frac{12m}{16m} = \frac{3}{4}$

[b] 1 $\because y \propto X$ $\therefore y = mX$ $\therefore 2 = 6m$

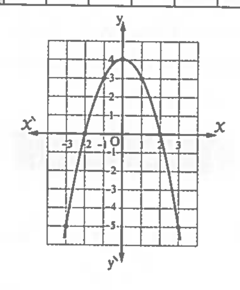
$\therefore m = \frac{1}{3}$ $\therefore y = \frac{1}{3}X$

2 At $X = 15$ $\therefore y = \frac{1}{3} \times 15 = 5$

5

[a] $f(X) = 4 - X^2$

X	−3	−2	−1	0	1	2	3
$f(X)$	−5	0	3	4	3	0	−5



From the graph :

1 The vertex of the curve is : (0 , 4)

2 The equation of the axis of symmetry is : $X = 0$

[b] Form the table by yourself , then $\sigma \simeq 4.98$

27 Matrouh

1

1 a 2 b 3 d 4 a 5 d 6 a

2

[a] $R = \{(1, 3), (2, 6), (3, 9)\}$

R is a function because every element in X has only one image in Y

, its range = $\{3, 6, 9\}$

[b] $\because \frac{a}{b} = \frac{2}{5}$ $\therefore a = 2m$, $b = 5m$

$\therefore \frac{2a - 2b}{3a + 2b} = \frac{4m - 10m}{6m + 10m} = \frac{-6m}{16m} = \frac{-3}{8}$

3

[a] 1 $X = \{1\}$, $Y = \{1, 3, 5\}$

2 $Y^2 = \{(1, 1), (1, 3), (1, 5), (3, 1), (3, 3), (3, 5), (5, 1), (5, 3), (5, 5)\}$

[b] $\because \frac{X}{2a + b} = \frac{y}{2b - c} = \frac{z}{2c - a}$

Multiplying the two terms of the 1st ratio by 2 and adding the antecedents and consequents of the 1st and the 2nd ratios

$\therefore \frac{2X + y}{4a + 2b + 2b - c} = \frac{2X + y}{4a + 4b - c}$

= one of the given ratios. (1)

Multiplying the terms of the 1st ratio by 2 and the 2nd by 2 and adding the antecedents and consequents of the three ratios

$\therefore \frac{2X + 2y + z}{4a + 2b + 4b - 2c + 2c - a} = \frac{2X + 2y + z}{3a + 6b}$

= one of the given ratios (2)

From (1) and (2) :

$\therefore \frac{2X + y}{4a + 4b - c} = \frac{2X + 2y + z}{3a + 6b}$

4

[a] $\because$ (a , 3) satisfies the function

$\therefore 3 = 4a - 5$ $\therefore 4a = 8$ $\therefore a = 2$

[b] Form the tables by yourself , then $\overline{X} = 2$, $\sigma \simeq 0.96$



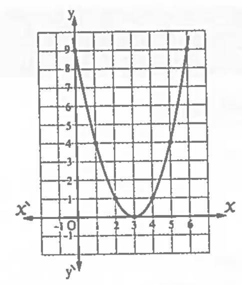
[a] $\because y \propto \frac{1}{X}$ $\therefore X y = m$

$\therefore 3 \times 10 = m$ $\therefore m = 30$ $\therefore X y = 30$

at $X = 5$ $\therefore 5 y = 30$ $\therefore y = 6$

[b] $f(X) = (X - 3)^2$

X	0	1	2	3	4	5	6
$f(X)$	9	4	1	0	1	4	9



From the graph :

* The vertex of the curve is : (3 , 0)
* The minimum value = 0